STRATEGIC LOAN PORTFOLIO MANAGEMENT IN A CHANGING RISK ENVIRONMENT

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Introduction

Strategic loan portfolio management is a forward-looking process that integrates bank priorities and credit culture with 1) the technical aspects of credit administration - risk identification, measurement and monitoring, 2) internal controls that attempt to maximize expected earnings at acceptable levels of loan portfolio volatility, and 3) capital adequacy constraints. Bankers have become more active portfolio managers and they are increasingly taking a strategic portfolio management approach. Although there may be several reasons for this development, the central objective may be to improve the level of risk-adjusted performance.

Haubenstock suggests that previous bank models have emphasized shareholder value and strategic planning (the returns and growth aspects of bank management) with only weak recognition of risk. The more recent attention given to risk-adjusted return on capital (RAROC) is an attempt to include the three primary forms of risk (market, credit and operating) in a measure of either the historical or expected return on capital. Yet, the expected RAROC measure incorporates only the risk-return component of the management problem. When shareholder analysis and risk management are integrated, the result is a more effective risk-based strategic planning model. In recognition of this perspective, bankers are also taking a more strategic approach toward portfolio management in which the risk-adjusted return on capital plays a central role.[1]

Credit models are relatively recent innovations, yet they have become an integral part of active portfolio management because they are helpful in predicting changes in portfolio credit quality. The models tend to vary in financial sophistication. Some are relatively sophisticated portfolio models of credit risk that rely on market indicators of asset value and/or risk-rating of debt instruments as an aid in quantifying, aggregating and managing risk across geographical and product lines. Regardless of their sophistication, the outputs of these models are playing an increasingly important role in bank risk management, in capital structure decisions, and in the development of performance measurement processes. It is likely also that they will be used in risk management examinations by regulatory agencies and in the determination of bank regulatory capital requirements (Yellen; Basle Committee on Banking Supervision).

In contrast with large commercial banks, agricultural lenders are more limited in their opportunity to simply apply the sophisticated credit models that have been developed, since they cannot rely on access to financial market data from which to assess client risk. Rather, they must find ways to adapt the principles of these models (along with the use of traditional credit analysis) to manage their loan portfolios. However, as agricultural lenders become more active portfolio managers, they can benefit from employing appropriate credit models and adopting a strategic portfolio management approach.

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1 The bank management literature makes a distinction between the risk-adjusted return on capital (RAROC), the return on risk-adjusted capital (RORAC) and the risk-adjusted return on risk-adjusted capital (RARORAC) . RAROC measures the contribution to shareholder value relative to capital after adjusting the return for the cost of capital or hurdle rate to measure "economic profit." RORAC measures the contribution that returns make to shareholder value relative to the level of "economic capital." RARORAC combines these two adjustments. These measures will be defined and illustrated later in the paper.

Our primary objective is to explore the framework for strategic loan portfolio management. We do this by considering the changing risk environment of banking, the application of principles of credit risk modeling and risk identification when quantifying portfolio risk, the integration of bank capital requirements and risk-adjusted performance measures, and the use of active portfolio management strategies. We also illustrate selected aspects of strategic loan portfolio management with agricultural lender applications.

The Risk Environment

Bessis suggests that the risk environment in banking has evolved both in magnitude and frequency due to new competition, product innovations, shifts from bank-based to market-based financial systems, increased market volatility, and the disappearance of traditional barriers.

Similarly, the processes that generate portfolio (credit, operational and market) risks have been variously described as waves of change or factors. Credit risk models tend to follow modern financial theory as they break these processes down further into systematic and nonsystematic risks. Systematic risks are those that cannot be diversified away, since they are driven by an underlying set of factors that are economy-wide and common to the rates of return generated by financial and nonfinancial assets. Nonsystematic risks are those that can be theoretically eliminated by selecting a well-diversified portfolio of assets.

The approaches to selecting factors that explain rates of return fall into two general categories. One approach is to specify macroeconomic and financial market variables that capture the systematic risks of the economy. The second approach is to specify the characteristics of firms that explain differences in sensitivity to systematic risks. The mainstream of the empirical finance literature on asset pricing suggests that macroeconomic factors tend to dominate the process that generates systematic returns.[2] Macroeconomic factors such as GDP (industrial production) growth, expected and unexpected inflation, exchange rates, term structure and yield spreads have been used to model systematic risk.

External Factors

From a quantitative credit risk perspective bankers are primarily interested in managing asset quality. As a result, they would like to be able to predict default rates and default rate volatility. Wilson (1997a) asserts that macroeconomic data predicts default rates quite well. Moody's Investor Service finds also that the sources of default rate volatility, while many, are closely tied to macroeconomic variables (Carty and Lieberman).

Based on the past two decades, we observe that economic conditions in agriculture are affected also by macroeconomic developments (Pederson et al.). In particular the level of credit risk in agriculture tends to escalate in periods of market instability, often as a result of macroeconomic

2 This is the approach of Chen, Roll and Ross, who argue that the selection of factors should consider the forces that explain changes in the discount rate and expected cash flows. The reader is referred to Ingersoll for a review of the arbitrage pricing theory and to Campbell, Lo and MacKinlay for a good technical summary of the underlying factor models and empirical results.

forces. Macroeconomic shocks are an important contributor to that market volatility in the form of changing interest rates, exchange rates, and commodity prices. In order to explore the sources of these macroeconomic shocks we can place them into two general categories. *Policy shocks* are due to the actions of government (e.g., unexpected changes in monetary policy, fiscal policy, and farm policy). *Productivity shocks* are generally due to changing real economic and natural conditions (e.g., unexpected changes in underlying aggregate supply and factor productivity).

Policy Shocks

Recent history has demonstrated that policy shocks can emanate from either international or domestic sources. We provide three examples. The currency crisis in Southeast Asia is an example of an international policy shock. Some countries in the region had maintained the policy of an overvalued exchange rate. When these countries allowed their currencies to float against the U.S. dollar, during mid-to-latter 1997, a series of currency attacks occurred. The result was a significant (40-70 percent) depreciation of the currencies in Indonesia, Malaysia, the Philippines and Thailand, and slower economic growth in Southeast Asia. This precipitated a financial and economic crisis that reduced U.S. agricultural exports to the region (Dwyer). Given the global nature of the crisis, U.S. exports to non-Asian countries were also expected to fall.

Domestic monetary policy innovations also affect agriculture and the general economy through several alternative channels: interest rates, exchange rates, and credit availability. In the early 1980s U.S. monetary policy actions that were designed to bring about price stability led to sharp interest rate fluctuations and, in turn, liquidity and solvency problems for farmers that were carrying high debt positions.

Passage of the Federal Agricultural Improvement and Reform Act of 1996 (or FAIR) is another form of domestic policy shock. The U.S. farm program provides for a phased elimination of price supports for a variety of crops. This adds price uncertainty to agricultural commodity markets. With less of a government safety net to protect farm income levels, agricultural producers, processors, and lenders will need to learn what risk management strategies to employ in this new market environment.[3] Thus, there is likely to be a period in which the risk exposure of agricultural lenders is increased due to FAIR and other farm policy innovations.

Productivity Shocks

Productivity shocks generally include unanticipated economic events and noneconomic forces. An unexpected increase in the cost of energy is a commonly cited productivity shock. Similarly, various climatic events (e.g., drought, flood), persistent crop or livestock diseases, or breakthroughs in technology are considered productivity shocks – which may have a positive or negative effects on output. The onset of a productivity shock is generally difficult to anticipate. Moreover, the economic impacts of such a shock may be distributed quite broadly and over long periods of time.

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3 The findings of a recent survey indicate that price risk management among commercial scale grain farmers is still rather underdeveloped (Hanson and Pederson).

Internal Factors

In addition to the external economic situation, an internal perspective can contribute to a further understanding of the range of factors that influence the level of credit risk. Internally, a bank relies on an effective credit culture (adherence of bank loan personnel to internal credit assessment procedures and policies) to develop timely, accurate, and consistent risk-rating information as the basis for monitoring and managing the exposure to credit default risk. This information serves as the foundation for strategic loan portfolio management.[4] While credit risk is typically associated with exposures in the "hold portfolio," the desired information on default rates in these assets is not readily available. Moreover, the size of a loan commitment is not usually adequate information from which to assess the *quality* of the risk (the likelihood of default) and the *quantity* of the risk (the amount that could be lost if default occurs). While banks increasingly appraise the quality of risk through the use of formal or informal internal risk-rating systems, they tend to vary widely in their use of "limit systems" and diversification rules of thumb. Thus, banks may not effectively integrate the information derived from their risk-rating activities with the use of these limit systems.

Moreover, the cumulative credit exposure in a portfolio is difficult to appraise because of diversification effects, and the problems associated with developing quantitative risk measures of those effects. These information problems contribute to an unexpectedly greater credit risk exposure when market volatility increases. For this and related reasons, banks have turned to the development and use of credit (risk) models.

Credit Models

Credit models use a portfolio approach and analytical techniques that are applied widely in the insurance industry to model a sudden credit event, e.g., a default.[5] The methodology is modern in the sense that it calculates the level of economic capital required for credit risk, it establishes the level of loan loss provisions on an anticipatory basis, and it measures diversification and concentration to assist in setting individual borrower limits and concentration limits in the portfolio.[6] CreditRisk+ (Credit Suisse First Boston), CreditMetrics (J.P. Morgan & Co.) and PortfolioManager (KMV Corporation) are three of the primary credit models currently in use (Caouette et al.).

Generally, credit models may be classified in terms of how they measure credit losses. In general the models define a credit loss as the difference between the current value of the portfolio and its future value at the end of some planning horizon. Conceptually, this change in value could be either due to a default event or a deterioration in the market value of the portfolio, short of default. Thus, the two paradigms for model development and the determination of losses are the "default mode" and the "mark-to-market" mode. The mark-to-market mode requires that loans (or bonds) be valued at their market price when either credit quality or market

4 Credit risk is the risk of default (or the increase in the probability of default) that results in a loss.
5 This contrasts with the mathematical techniques used in financial modeling where the focus is on continuous price changes rather than sudden events.
6 The Basle Committee on Banking Supervision provides a useful overview of the conceptual approaches and methodologies used in credit risk models.

conditions change by using a discounted contractual cash flow approach.[7] The default mode appears to be more adaptable to the loan portfolios of most commercial banks.

Default Models

Credit default models are largely statistical models that make no explicit assumptions about the causes of default. Given that default rates are not constant over time and that they may exhibit a high degree of variation, defining the default rate process is of central theoretical importance in these credit models. From a methodological perspective as well, the modeling of default rates is critical to determining the distribution of credit losses. Credit risk measures (the potential loss in value) are derived from measures of *credit quality* (the probability of default) and *credit exposure* (the potential net loss in value if default occurs). Ultimately, a bank derives the probability distribution of losses by aggregating across the different loan facilities that it provides. The resulting estimated distribution of losses is then used to set the level of capital allocation (economic capital) to cover unexpected losses as a multiple of the estimated standard deviation of losses.

Although the primary models differ in their approach, and in their relative strengths and weaknesses, the statistical comparisons performed by Finger and Gordy suggest that the models do not differ greatly in their results. Lentino and Pirzada suggest that a more significant issue is the preparation that a bank needs to undertake in order to provide reliable and consistent loan portfolio information in order to use them.

A Representative Model

Default rates may be modeled either as discrete variables (where individual risk ratings are "mapped into" default rates via a rating transition matrix) or as continuous random variables (where the distribution of default rates is characterized by its mean and volatility).

The credit valuation model developed by Vasicek uses the assumption of continuous random variables to establish the relationship between the market value of the firm's debt and the probability of default. The resulting default rate distribution is used to derive the expected loss due to default. Following Vasicek, we define a firm as an entity consisting of its assets (A) with the claims on those assets consisting of current liabilities (C), short-term debt (D), long-term debt (B), and equity (S). Let D_T denote the face value of the short-term debt at maturity. Assume that the amount of current liabilities payable at time T are C_T and the maturity of the long-term debt is greater than T. Further, assume that total asset value is a random variable that follows a stochastic process described by

$$dA = \mu A dt + \sigma A dz \qquad (1)$$

where time (t) > 0, μ and σ^2 are the instantaneous mean and variance of the rate of return on assets, and dz is an increment of the stochastic process.[8]

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7 This is the approach used by CreditMetrics.

8 The first term (with dt) on the right side of (1) is the expected "drift" rate of asset value (the random

Assume that the short-term loan is in default if the value of the assets at the maturity of the loan is less than the amount payable, $A(T) < D_T + C_T$. Let p denote the probability of default, where A(0) denotes the initial value of assets.

$$p = P[\, A(T) < D_T + C_T \mid A(0) = A \,] \tag{2}$$

By evaluating this probability, we have

$$p = P[\, \log A(T) < \log(D_T + C_T) \,|\, A(0) = A \,]$$

and,

$$p = N\left(\frac{\log(D_T + C_T - \log(A - F) - \mu T + \frac{1}{2}\sigma^2 T}{\sigma\sqrt{T}} \right) \tag{3}$$

where F is the sum of interest paid on long-term debt and dividends paid to equity holders, and N is the cumulative normal distribution function.

The loan loss (L) on the short-term debt is

$$\begin{array}{lll} L & = 0 & \text{if } A(T) \geq D_T + C_T \\ & = D_T + C_T - A(T) & \text{if } C_T \leq A(T) < D_T + C_T \\ & = D_T & \text{if } A(T) < C_T \end{array} \tag{4}$$

The expected loss (EL) is found by integrating (4) with respect to the density function for the value of assets,

$$EL = \int_{C_T}^{D_T + C_T} (D_T + C_T - a) f(a) da + \int_0^{C_T} D_T f(a) da \tag{5}$$

where f is the probability density of A(T). By evaluating (5) we find that EL is equal to the expected loss on the combined claim - comprised of the current liabilities and the short-term debt. The expected loss is the face value of the claim multiplied by the probability of default (which is the expected loss on the claim before recoveries) less the recovered amount. From a credit model perspective, increases in the expected loss reflect a leftward shift in the probability density of asset value due to either a decrease in the expected value of the asset or an increase in the volatility of the asset value. The first effect on losses could be evaluated using an asset-pricing model, while the second effect could be evaluated by making alternative assumptions about the underlying stochastic process in (1). There would be corresponding (rightward) shifts

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variable) and the second term (with dz) is the stochastic component that adds variability to the path of asset value.

in the probability density for loan default, given the level of debt is held fixed.

Credit valuation models provide a potentially useful structure for the determination of expected loan loss. As the equations show, one of the key requirements is information on the probability distribution of default. Once the distribution is known, it is possible to calculate the expected loss and establish the level of capital and/or loss provisions to cover those expected losses. Having determined the distribution of losses, it is also possible to establish the amount of economic capital required for unexpected losses at some acceptable level of confidence. Knowledge of these capital requirements is one of the key strategic objectives of credit models. In order to develop knowledge of the underlying distribution of default (or credit quality), it is important that lenders evolve a system for internal risk-rating of clients.

Risk-Rating and Migration

Risk rating information plays a central role in credit models, since the application of credit risk models is limited to risk-rated assets. In order to implement a credit risk model the bank's internal credit risk rating is key to establishing the likelihood that a loan will migrate from its initial state to either the default state or a lower risk class within the established time horizon of the model.[9]

For example, if the time horizon is one year, the possible events are "default" or "no default." Binary events such as this can be modeled by assuming for large portfolios that the underlying default event can be modeled using a Poisson distribution. However, if the time horizon reflects a hold-to-maturity strategy, default or a change in credit quality may occur in any given period, and alternative risk migration scenarios are possible. In this case the risk migration process can be modeled using a scenario approach, as illustrated in Figure 1.

Credit risk models help to focus the attention of bankers on the important role of customer risk rating information and the methods used to translate that information into estimates of default rates and the distribution of losses at the portfolio level. Through this approach a banker is required to identify the underlying elements of credit quality and to formalize them in a risk-rating system. Where credit quality ratings are readily available (e.g., with bond ratings) the identification of the loss exposure appears to be relatively straightforward.

Ideally, borrower information may be used to measure credit risk at the individual asset level and to prepare a rating transition matrix for the loan portfolio (the so-called "bottom-up" approach). However, the presence of dependencies between credit events complicates this approach, as default rates may be correlated due to the effects of macroeconomic factors. Also, complications arise because default rate correlations are generally unstable and there is frequently a lack of empirical data with which to model them.[10]

In order to handle correlations among either defaults or rating migrations, credit risk models may

9 Shearer and Christensen provide a useful discussion of the need for multiple approaches to migration analysis due to credit cycles that complicate the process of predicting credit quality adjustments.
10 In large portfolios the probability of individual default is small and may reasonably follow a Poisson distribution, but in smaller portfolios that may not be a good assumption.

take either a *structural approach* or a *reduced-form approach*. The structural approach (followed by CreditMetrics and PortfolioManager) assumes an explicit microeconomic model of the process determining the defaults or rating migrations of the individual customers. In the structural mode the change in a customer's risk rating (or "migration risk factor") is correlated with similar measures of risk migration across other borrowers.[11] The reduced-form approach (followed by CreditRisk+) assumes that a particular functional relationship exists between the expected default rate or risk migration matrix and selected exogenous "background factors." Correlations between the financial conditions of customers and changes in these background factors are used to drive the risk migration process. Bankers might choose between these two approaches based on which fits the data better (Basle Committee on Banking Supervision).

Capital and Performance Measures

Traditionally, lenders focus on book capital and regulatory capital. Book capital is the sum of equity capital invested by shareholders plus retained earnings, while regulatory capital is the minimum amount of capital that must be held as directed by the regulating agency. Because of changes in the portfolio risk profile over the business cycle, current book capital and the regulatory capital requirements may not be adequate to cover unexpected losses due to credit risk, operational risk and market risk.

Economic Capital

Economic capital requirements are a better indicator of the minimum amount of risk capital required to cover unexpected losses. The level of economic capital can be illustrated as in Figure 2. Provisions for loan loss are assumed to be adequate to cover expected loan losses. Economic capital is the amount required for losses in excess of the expected level. The banking literature refers to this as the amount of "capital at risk." When the economic capital requirements incorporate the unexpected losses associated with transaction risk, intrinsic risk, and concentration risk of a portfolio over an economic cycle, the level of provisions and economic capital should be adequate to cover both expected and unexpected losses. Thus, the total economic capital requirement is the minimum amount of risk capital to support the current level of portfolio risk. Probable credit quality deterioration or an increase in the level of portfolio risk would logically require additional risk capital.

Risk-Adjusted Performance Indicators

Rate of return on assets (ROA) and rate of return on equity (ROE) have been used as traditional indicators of bank profitability and performance. Risk-adjusted performance indicators, such as the risk-adjusted return on capital (RAROC), the return on risk-adjusted capital (RORAC), and risk-adjusted return on risk-adjusted capital (RARORAC) are potentially more useful since they incorporate an economic measure of risk into the calculation of bank performance.[12] RORAC is the net operating profit after taxes divided by the required level of risk-adjusted capital. Another

11 Typically an additional assumption or estimation is made to measure the effect of this correlation.
12 Dermine cites some pitfalls to using these risk-adjusted measures in loan management (e.g., using a single hurdle rate, timing of loan loss provisions, duration of funding, and the time horizon of equity allocation).

indicator is the economic profit (or the economic value-added). Economic profit is the net operating profit after taxes minus a charge for the cost of capital, where the cost of capital is the required rate of return on capital (the hurdle rate) times the amount of economic capital. The RAROC has received the most attention in the banking literature due to focus on shareholder value. However, the RORAC and RARORAC are useful measures of the return on economic capital, and particularly useful when evaluating capital management strategies.

Risk Identification

Conceptually, increasing credit risk can be defined in terms of an adverse shift in the probability distribution of loss.[13] Alternatively, it could be defined in terms of a sudden credit event (e.g., the default of large borrowers) or a general deterioration in credit quality that may threaten the solvency of the bank. The definition of credit risk as an event such as default or the deterioration of credit quality is consistent with the use of scenario analysis and the identification of portfolio risk limits.

Following this latter approach, we depart from the statistical framework of the preceding credit models, in order to quantify risk and the corresponding level of economic capital. The approach taken to risk identification does not rely on a set of explicit assumptions about the probability distribution of default rates or the inter-correlation (hence, joint probability distribution) of default rates as in the formal credit models.[14] Rather, the approach is to identify the components of credit risk and quantify the corresponding levels of risk, assuming initially that the credit events are not correlated. This is a less formal approach to credit risk modeling, and one that provides a first-order approximation to the quantity of risk. It has the advantage of flexibility for use in an agricultural lender setting where credit risk identification is important, yet market information on credit quality and knowledge about the inter-correlation of default rates are not readily available.

Decomposing Credit Risk

Portfolio risk includes market risk, operational risk and credit risk. Market risk derives from adverse interest rate movements and the resulting decrease in the market values of assets with relatively fixed returns. Operational risk arises due to inadequate bank policies, procedures, systems and controls. Based on McKinley and Barrickman, the composite level of credit risk in a portfolio can be decomposed into transaction risk, intrinsic risk and concentration risk.

Transaction risk is the risk of volatility in credit quality and earnings resulting from loan selection and underwriting, loan documentation, and credit administration. Transaction risk focuses on the variability of asset (credit) quality and the volatility of earnings through individual loan transactions. In the past the management of transaction risk has been useful in controlling the exposure to individual loan default risk. Logically, it is of more limited value when trying to predict future portfolio quality.

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13 This is analogous to the definition of increasing risk proposed by Rothschild and Stiglitz (Ingersoll, 1987, pp. 119-121).

14 Hence, it will not be possible to make probability statements at different confidence levels for capital adequacy.

Intrinsic risk reflects the potential for portfolio deterioration due to historical, predictive, and lending risk components. When partitioning the portfolio for an evaluation of these components of intrinsic risk, the objective is either to identify homogeneous sub-portfolios that share certain characteristics, such as sensitivity to macroeconomic and/or sectoral determinants of performance, or they represent clients that group themselves according to the three risk elements. This is a relatively eclectic process that requires extensive knowledge of the client base of the bank. The historic components reflect prior performance and the risk that is inherent to a particular line of business (e.g., loan type) or industry (e.g., agricultural product). Similarly, the predictive components focus on characteristics that are subject to change and could either positively or negatively affect future loan performance. The lending component of risk focuses on how collateral requirements and the terms of the loan affect the level of intrinsic risk.

Concentration risk is the aggregation of transaction and intrinsic risk elements. This could be within a line of business, an industry, a geographic area, or volume of loans extended to the largest customers. Thus, concentration risk indicates the potential magnitude of future portfolio deterioration.

Concentration has taken on new meaning in agriculture. A major reason has been the redefinition of assets in the financing of agriculture, as a result of the industrialization of agriculture (Boehlje). Industrialization has produced efficiency gains, arguably it has also increased the potential risk to producers due to reduced flexibility and less ability to adjust if supplies of inputs and/or prices of inputs suddenly change. To reduce these risks farmers have entered into various forms of supplier and production sales contracts. Through these contractual obligations they are exposed to other industry risks - some of which are relatively new to agricultural lenders (e.g., environmental, health and food safety risks).

As a result, contractual arrangements may have reduced the level of exposure to market price risk and availability risk, but they have increased the level of contractual "relationship" risk exposure for farmers and lenders – i.e., intrinsic risks. The values of these "soft" contractual assets are tied to contracts, which require that business relationships with contractors (suppliers and processors) be more fully evaluated through a "structured credit analysis," as implied by an assessment of portfolio intrinsic risk.

Credit Risk Profile

It is not uncommon for lenders to conclude that transaction risk analysis is sufficient to manage their credit risks. Yet, to assess portfolio credit risk exposure it is important to develop a quantitative *risk profile* based on all three of the risk components. To do this we adapt the methodology of McKinley and Barrickman to the portfolio of an agricultural lender (Wilberding).

In Table 1 we decompose the risks in a hypothetical agricultural lender's loan portfolio. The transaction risk profile incorporates characteristics such as the borrower risk-rating, risk weights for each of the credit risk classes, and the proportion that each credit risk classification represents of the outstanding loan portfolio volume. The intrinsic risk profile identifies risk exposure

according to various sub-portfolios: industry type (e.g., dairy, grain, hogs), line of business (e.g., mortgages, operating loans, intermediate-term loans leases) and farm involvement (e.g., full- or part-time operators, farm-related businesses, processing and marketing operations). The concentration risk profile incorporates several of the components already identified in the industry risk profile, but does so by looking at various sub-portfolios (e.g., the largest industry, the largest borrowers, the largest farm involvement, and the largest line of business).

Transaction Risk Profile

The information on transaction risk is a result of applying the internal risk-rating procedures of the bank to each loan or lease in the portfolio. To the extent that all loans and leases are risk-rated, the resulting profile will be a closer reflection of the overall credit quality of the portfolio. Typically, the commercial loan portfolio would be risk-rated, but other categories such as mortgages and consumer loans may also be scored. Since risk-rating systems can vary greatly from lender to lender, the number of risk classes and the criteria used for rating loans will determine the resulting transaction risk profile of the lender.

To quantify the transaction risk of a portfolio, the percentage of loan volume in each risk class is weighted (multiplied) by an assigned risk weight and by the percentage of loan volume outstanding in that risk class. The sum of these weighted risk ratings is divided by total loan volume outstanding to calculate the weighted-average risk rating (WARR) for the portfolio. The WARR is evaluated against a rating profile for overall transaction risk to determine the score for the composite transaction risk in the portfolio.

Intrinsic Risk Profile

The intrinsic risk component supplements the traditional risk rating information by including "structured reviews" of the various lines of business and types of lending that comprise the portfolio. With greater heterogeneity in the overall loan portfolio, there is a greater incentive to perform such a structured analysis because of the additional portfolio level information that is generated.

For this purpose, McKinley and Barrickman have developed an intrinsic risk scoring worksheet that provides a framework for identifying and monitoring changes in portfolio risks in the key areas of industry type (Table 2a) and line of business (Table 2b). In each of those areas, the worksheet structures the evaluation of risk along three dimensions: historical, predictive, and lending risks. The *historical* risk elements account for changes in financial performance, structure of the bank's clients, and past stability of the industry. The *predictive* risk aspects of the evaluation consider likely changes in factors such as product and input pricing, margins and competition, the political environment, the environment, product innovations, and correlation with other industries. The *lending* risk elements account for expected changes in collateral values and liquidity, and the terms under which loans would be written and monitored. Barrickman, Bauer and McKinley suggest that the intrinsic risk scoring worksheet should be updated annually and tracked over time.

In Table 2a, a lender would enter a "1" in those cells that best indicate the subjective view of the

lender (e.g., credit committee) concerning the degree of risk for each factor in a given industry segment. The scores for these elements are summed by column. The sum is multiplied by a weight (-1, 0, or 2), these weighted scores are then summed across columns to get a "Total" and that number is added to a score of 24 (a scaling parameter) to derive the industry risk rating. This industry intrinsic risk score is an ordinal measure of intrinsic risk for that industry segment. A similar procedure is followed in Table 2b to develop an intrinsic risk rating score for each identified line of business in the portfolio. In Table 2b the scaling factor is 20, since there are 10 categories for risk scoring (as compared to 12 categories in the industry risk rating worksheet).

In order to quantify the overall level of intrinsic industry risk in the portfolio, each industry subportfolio intrinsic risk score is multiplied by the percentage of loan volume in that subportfolio, then the weighted intrinsic risk scores are summed over all subportfolios. The result is a weighted-average industry intrinsic score. A similar procedure is used to derive the overall weighted-average line of business intrinsic score. Because the maximum industry intrinsic risk score is 48 (12x2 + 24), while the maximum line of business intrinsic risk score 40 (10x2 + 20), the industry intrinsic risk score is converted into a line of business score. The average of the converted industry intrinsic risk score and line of business score is the composite intrinsic risk score for the overall portfolio. As will be shown, the composite intrinsic risk score is converted into "intrinsic risk profile points" that reflect the level of intrinsic risk in the portfolio.

Intrinsic risk rating is a critical step in developing a strategic lending plan since it involves assessing the intrinsic risk environment and communicating the intrinsic risk rating to loan officers – both are important aspects of the credit culture in a lending organization. Through annual evaluations of the intrinsic risk position in each of the loan sub-portfolios, it is possible to set portfolio exposure limits and develop a lending strategy for each industry and line of business. In the Farm Credit System the intrinsic risk rating process at the level of an association varies in terms of the source of expertise on intrinsic risk. It may be internal or external and it may be supplemented by "front-end guidance" from credit specialists who provide economic outlook information on the sectors represented by the various loan sub-portfolios.

Concentration Risk Profile

Portfolio concentrations increase the magnitude of the portfolio effects due to changes in transaction risk and intrinsic risk. Thus, surprises such as an unanticipated increase in defaults translates into increased portfolio volatility. As concentrations increase, there is a need to increase the level of capital that is maintained in order to absorb unexpected losses. Thus, as the loan volume in a specific concentration increases relative to the capital of the bank, the degree of concentration risk also escalates – reflecting the greater potential for surprises or unexpected losses. The concentration risk profile attempts to quantify the level of these risks in four areas: industry, line of business, farm involvement, and largest borrowers.

McKinley and Barrickman suggest a specific methodology for quantifying concentration risk at the portfolio level. For example, the percentage of total loan volume that is represented by a given concentration category (e.g., largest industry) is divided by the percentage that volume represents of bank capital. The resulting number is a measure of the exposure of capital to a loss

if that concentration were to experience an unexpected deterioration of credit quality. The number is evaluated against a rating profile to assign a score to that concentration segment. Similar calculations are made for concentrations such as line of business, farm involvement, and the largest 10 borrowers. The overall concentration risk profile is a weighted-average of the four concentration risk profile scores.

Application of Risk Identification

In 1997, FirstAg Farm Credit Services managed a portfolio dominated by agricultural loans and leases to full-time farmers. About 94% of its $444.2 million loan volume was classified as acceptable, ranging from A-1 to A-4 in risk classification (Table 3). The portfolio contained industry loan concentrations in loans to corn and soybean (40.1%), dairy (19.6%) and swine (21.6%) producers in its service area. It also contained line of business concentrations in agricultural mortgages (54.1%), intermediate term loans (25.8%). The ten largest borrowers account for about 57% of association capital.

In 1997, the weighted average risk-rating of the FirstAg loan portfolio was 2.92. This translates into 23.5 transaction risk profile points - a moderate level of transaction risk. The intrinsic risk score for the industry factor was 25, for the line of business factor it was 20.9, and for the farm involvement factor it was 22.2. The overall score is then translated into profile points.[15] As a result, the overall intrinsic risk profile points for FirstAg in 1997 was 20.8 - a moderate level of risk. Due to high loan volumes relative to the amount of association capital the concentration risks were relatively high in corn and soybeans (32.6 profile points), agricultural mortgages (41.3 profile points), and full-time farmers (45 profile points), but at a moderate level for the ten largest borrowers (17.2 profile points). The overall concentration risk profile of the association was 30.4, which is a weighted-average of the four component profile points.[16]

For interpretation, McKinley and Barrickman suggest that composite risk profiles can vary from *conservative* (where all three component risk profiles are at low levels) to *managed* (where two of the risk profiles are at low levels) to *aggressive* (where one of the risk profiles is at a low level).[17] Some alternative bank risk profiles are illustrated in Figure 3. The composite risk profile points for FirstAg in 1997 is 74.6 - a "managed" risk position that borders on an "aggressive" risk position. In this case none of the component risk profiles is at a low level and the concentration risk profile is relatively high.

Using the FirstAg economic capital allocations, the required economic capital in 1997 was approximately $50.2 million (Table 4).[18] This compares with $53.3 in book capital and suggests

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15 The overall intrinsic risk score is a weighted average of the component intrinsic risk scores.
16 For this illustration, the weighting used for concentration risk is: corn and soybeans (0.35), agricultural mortgages (0.15), full-time farmers (0.15), and the ten largest borrowers (0.35).
17 McKinley and Barrickman suggest that conservative policies represent those with total risk profile points less than 50, while managed risk positions have risk profile points between 51-75, and aggressive positions have profiles exceeding 75 points.
18 The economic capital allocation percentages by loan risk class are: A-1 (6%), A-2 (8%), A-3 (11%), A-4 (15%), M-5 (20%), S-6 (25%), S-7 (32%), and D-8 (50%). Here the loan risk classifications are: A – acceptable, M – special mention, S – substandard, and D – doubtful or loss.

that the association was adequately capitalized for the level of credit risk. Given the association's ROA for 1997 was 1.40%, the RAROC was 0.37%. In this case the association is generating only slightly more than the required rate of return on capital. Based on the level of economic capital and the required rate of return (12%), the economic profit was $196,587. The corresponding measures of returns to the economic capital employed were RARORAC at 0.39% and RORAC at 12.39%.

Analogous to the economic capital of a bank, one can define the transaction risk capital. This is the level of capital that is required to adequately cover the unexpected losses that are associated with just the transaction risk exposure of the bank. Since the level of economic capital is to cover all three components of credit risk (the transaction, intrinsic and concentration risks), while transaction risk capital covers only part of that overall credit risk, the level of transaction risk capital is expected to be a lower amount. Thus, the transaction risk capital allocation percentages are slightly lower than those for economic capital and the required level of transaction risk capital is lower at 8.2%. For this reason, the RORAC for transaction risk capital is higher at about 17.1%.

During 1998, FirstAg experienced several major changes in its loan portfolio. One of the primary factors was the merger of FirstAg with a neighboring Farm Credit System association. The merger accomplished two strategic objectives for FirstAg. First, it accomplished a diversification of the loan portfolio by industry type. For example, it increased the volume of loans to dairy and poultry producers and other industries (e.g., horticultural enterprises) from 12% in 1997 to 30.6% in 1998, and correspondingly decreased the percentage of corn and soybean loans from 40.1% to 33%. Similar reductions occurred in the proportions of dairy and swine loans. Second, the merger brought about an increase in association book capital. Capital increased from $66.6 million to $75 million, increasing total capital from 12% to 12.56% of total assets. A negative impact of the merger was that there was a deterioration of credit quality. This is reflected by a higher WARR for transaction risk (3.12 in 1998 versus 2.92 in 1997). Due to the higher level of loan servicing costs, the new merged association realized a lower ROA of 1.35% in 1998.

The other factor driving the FirstAg loan portfolio in 1998 was the deterioration in commodity market prices and reduced profitability in agriculture. This translated into a migration of credits to higher risk classes and a higher WARR for the portfolio. The risk migration of loans in the 1998 portfolio is reflected in Table 5a for all risk-rated loans and leases. We note in Table 5b that the risk migration percentages for the sub-portfolio of swine producers indicate increasing credit risk relative to the rest of the portfolio.[19]

The deterioration of the agricultural economy is reflected also by the higher intrinsic risk scores assigned to the corn-soybeans, dairy, and swine producer loans. In recognition of these changes the credit manager at FirstAg increased the 1998 intrinsic risk score for the corn-soybean producer portfolio from 23 to 30 due to the declining value of grain inventories and the outlook for lower grain prices. The intrinsic risk score for swine loans was increased by a smaller

19 If one assumes independence across risk classifications, these percentages can be viewed as the unconditional probabilities that the loans in a given risk classification will either remain in their initial period risk class or migrate to another risk class in the subsequent period.

amount (from 30 to 32) since a large majority of the association's swine producers were operating under market contracts that guarantee a price for finished hogs.

The combination of events during 1998 (the merger and the deterioration of credit quality) translated into a shift in the credit risk profile of the association toward a higher credit risk position (Table 6). The net result of these changes was that the association composite risk profile moved from a "managed" position to an "aggressive" position. The transaction risk profile increased to 26.5 points, although it remained at a moderate risk level. The intrinsic risk position remained also at a moderate level, even though the profile increased from 20.8 to 24.5 points. This was due to increases in all three areas of intrinsic risk. The overall concentration risk of the association declined as a result of the increased diversification of the loan portfolio (intrinsic risk for industry and line of business both declined), although concentration among large borrowers increased.

Results in Table 6 also illustrate the nature of the strategic trade-off between risk reduction and returns when considering the implied changes for the capital position of the lender. Compared to the results for 1997, FirstAg capital increased to 12.56% and economic capital rose to 11.93%. However, economic profit fell to -$489,253 due to the combination of a higher economic capital allocation (required to cover the higher level of transaction and intrinsic risk) and the decline in ROA. This deterioration is observed in the negative RAROC and RARORAC measures for 1998, as the association was not able to meet the required 12% rate of return on capital. The RORAC measures for economic capital and transaction capital reflect similar declines in performance in 1998.

The FirstAg case provides an illustration of the combined effects of two historical events (merger and risk migration) on the risk profile of the association. A similar approach could be taken to evaluate the sensitivity of the portfolio to selected policy and productivity shocks. For example, the impact on credit quality of an adverse movement in commodity prices or a drop in production could be modeled under certain assumptions about the resulting risk migration of customers. Similar shocks could be evaluated for reducing government payments to farmers, increases in interest rates, and/or declining real estate values. These sensitivity and scenario analyses could be used to "stress test" the portfolio, and determine the additional level of economic capital required in various worst case scenarios.

Active Loan Portfolio Management

Quantitative risk profiles can be instrumental in setting goals and risk limits that are compatible with the long-term priorities of the bank's owners. They can also be helpful when defining an appropriate portfolio strategy to accomplish those objectives, including the management of credit risk exposure. Due to the greater potential for losses, an aggressive risk profile must be managed more actively than a conservative profile. Also, in a highly competitive lending environment the underwriting standards of a bank will likely come under greater pressure and may become more liberal. There is also likely to be a trade-off between how actively a bank controls its transaction risk exposure and how actively it manages its intrinsic and concentration risk exposures during these periods. Thus, the quantification of risk and the setting of risk limits are an integral part of active loan portfolio management.

What does it mean to be an active loan portfolio manager? The range of market options for managing a loan portfolio may be relatively limited for small, agricultural banks and relatively greater for larger banks. However, regardless of bank size there are two basic alternatives for consideration - either sell the loans and remove them from the balance sheet or retain the loans on the balance sheet but alter the default characteristics. Both strategies represent active portfolio management approaches.

By discounting loans (by industry, line of business, or farm involvement category) that have high concentrations and/or high intrinsic risk scores a lender can remove assets from the balance sheet and reduce the overall level of intrinsic and/or concentration risk. If the timing of the sale were such that it occurred before credit quality deteriorated, it would also prevent an increase in the overall level of transaction risk by reducing adverse risk migration in the portfolio.

We illustrate the impact of loan discounting at FirstAg Farm Credit Services by assuming that it sells $60 million in loans from its 1998 portfolio. It is assumed that the sale occurs at the book value of the loans (i.e., zero discount), reducing the outstanding loan balance to $537.4 million.[20] Corn-soybean and swine loans are potential targets for this strategy, since they carry relatively higher intrinsic risk scores and their volumes represent significant parts of the overall credit risk exposure of the association. For marketability, the loans to be sold are pooled in equal amounts from the A-1 through A-4 risk classes. Half of the loans to be sold are corn-soybean loans and the other half are swine loans. All of the loans are to full-time farmers with half of the loans comprised of intermediate-term loans and the other half being agricultural mortgages.

In Table 7 we observe that the impact of the loan sale is to increase the measure of transaction risk (to 27.5 points) and decrease the level of concentration risk (to 25.8 points). Had the association sold some of its lower quality loans, it could have reduced its transaction risk, although that would have been at a discount from their book value, resulting in a further risk/return trade-off for the association. Due to the offsetting nature of the risk adjustments, the sale of loans accomplished only a slight decrease in the overall credit risk position of the association as shown by the composite risk profile. Assuming the ROA remained stable, all of the indicators of risk-adjusted returns suggest that the performance of the association would deteriorate further and that, in this instance, the sale of higher quality loans to reduce concentration risk may not be an attractive strategy.

Risk Management Participations

A commercial lending facility (CLF) is a form of loan participation or syndication that can be created and used by associations in the Farm Credit System. The CLF is not a separate legal entity and does not have capital of its own. The primary purpose for creating a CLF is to pursue eligible commercial lending and leasing opportunities in the CLF's trade territory, and to serve as a risk management tool for the affiliated associations. The creation of CLF facilities is one way that Farm Credit System associations have attempted to respond to new lending initiatives

20 For simplicity, we assume that loan pay-offs and charge-offs just offset new loan volume so that the projected loan balance for 1999 remains at the initial level of loans outstanding in 1998 less the $60 million of loans sold.

(e.g., farm-related businesses). In addition a CLF potentially solves the problem of working with larger borrowers that may operate across the territorial boundaries of the associations and/or large borrowers that require a larger capital position than a single association can provide. Affiliating associations gain access to both expertise and capital resources that may enable them to underwrite new, larger, and more specialized clients.

From a strategic loan portfolio management perspective a CLF may enhance the capacity for risk management participations. Through loan syndication the participating associations can potentially control their large borrower concentration risk. Since all earning assets of the CLF are reflected on the books of the participating associations, the level of industry concentration risk is also manageable. Diversification of concentration risk may result also if the added loan volume is for nontraditional loans. These loans might include financing for agribusinesses that market and/or provide agricultural processing or other value-added services to farmers, livestock units linked to integrators, and manufacturers of agricultural equipment. They represent new forms of intrinsic risks for an association, yet, the CLF is an entity that might have the expertise to evaluate the industry and line of business risk elements more completely and consistently than a single association.

Strategically, an association may participate in larger, specialized loans without the requirement to allocate a higher-than-average level of bank capital to the loan. Since the risk exposure and funding requirements are lower, the contribution to the return on risk-adjusted capital is also potentially higher.

Credit Derivatives

Credit derivatives are relatively new financial instruments that can provide commercial banks and Farm Credit System associations with innovative ways to manage transaction, intrinsic and concentration risks. Although they have received rather limited use to date, credit derivatives aim at enabling banks to unbundle the credit risk from the client relationship, passing the risk through to the market while keeping the earnings component. Many lenders are still in the initial stage of assessing the strategic and economic value of this option.

Credit derivatives are privately-negotiated bilateral contracts that allow users to protect themselves against loan losses by transferring the risk to another party, while either keeping the loans on their books or swapping the loans for "safer" assets. These instruments may be particularly adapted for reducing concentration risk. Yet, similar to interest rate derivatives, there is in reality a substitution of one form of risk for another. Namely, in credit derivatives there is an exchange of retail credit risk for "counterparty" credit risk.

Asset swaps are the building blocks of credit derivatives. Asset swaps, as their name implies, are tied to the assets on the balance sheet. They are designed to change one or more of the attributes of the cash flow from the underlying asset. Two forms of asset swaps have grown in use - total return swaps and credit default swaps (Figure 4). Total return swaps enable lenders to diversify their credit loss exposure by paying or receiving total returns without taking the assets off their balance sheets. Credit default swaps enable lenders and investors to improve risk management for defined credit events (Das; Rai and Holappa; Theodore and Madelain; Whittaker and Frost).

In the case of a credit default swap, the credit event must be a material and objectively measurable default such as a loan payment default, a borrower declaration of bankruptcy, and/or the restructuring of a debt obligation which is materially detrimental to the debt holder. By swapping payments based on these contingent credit events, participants create synthetic loans that separate default risk from other risks. Credit default swaps are tailored to meet specific needs and are, therefore, highly customized.[21]

A credit default swap can be used when a credit limit has been reached with an individual borrower, or when a large borrower exposure has increased to an undesirable level. Alternatively, the objective may be portfolio diversification. Credit derivatives may also open the way for a new form of competition for agricultural and agribusiness loans. Commercial banks may be able to mitigate their risk exposure with credit derivatives, resulting in a larger appetite for agricultural risk and a greater willingness to underwrite agricultural risk and swap out part of that risk.

The focus of the new credit models and credit derivatives has been primarily business loans, yet increasingly agricultural mortgages are falling into that category of risk management. Thus, the Federal Agricultural Mortgage Corporation (FarmerMac) has become more active in the provision of credit derivatives in recent years. FarmerMac offers two credit risk products (Federal Agricultural Mortgage Corporation). The first is a "long-term standby agreement" under which lenders can manage their capital and control their portfolio risk. The second product is a credit default swap through which the lender receives an agricultural mortgage-backed security in return for qualified agricultural real estate loans. The volume of these transactions to date has been relatively small, but growing due to an increasing interest among Farm Credit System institutions and large commercial banks.

The FarmerMac standby agreement is a long-term commitment to purchase qualified agricultural real estate mortgage loans for a fee. Lenders pay the fee annually for as long as the commitment is in place. Loans in the commitment pool may be removed and sold, and new loans may be added. The benefits to the lender include the elimination of risk on loans in the commitment pool and the potential for reducing commodity and geographic concentrations in the lender's loan portfolio. In addition the stand-by agreement frees up capital, since it effectively reclassifies loans in the commitment pool so that they carry a 20% risk-rating for regulatory capital purposes (versus 100% on conventional loans). Thus, the reserve for loan losses may be significantly reduced.

A Credit Swap Illustration

Mid-Coast Farm Credit Services has been experiencing rapid loan growth during 1996-1998 and expects that growth to continue. In 1998 its loan volume was approaching $400 million. This created a capital adequacy problem for the association, since loan volume has grown faster than total capital. A strong marketing program has been a primary contributor to this rapid loan

21 The potential for growth of the credit derivative market is difficult to ascertain since it will depend on the standardization of the products, pricing, and documentation of the instruments and on the resolution of underlying regulatory issues (Steinherr, 1998).

volume growth and the association policy is not to turn away large acceptable customers due to the capital constraint. The association's preferred alternative is to manage the capital side of the balance sheet to accommodate the expected growth in assets while actively managing the portfolio risk with credit derivatives. A further motivation for management to use credit derivatives is that they represent a way in which to manage "regulatory risk."[22]

Mid-Coast analyzed the risk inherent in its portfolio due to concentrations and decided to enter into a $60 million credit swap with FarmerMac in 1998. This was a credit default swap where Mid-Coast swapped real estate loans for FarmerMac agricultural mortgage-backed securities (AMBS) on a pool of FarmerMac guaranteed loans. Based on its loan eligibility criteria, FarmerMac accepted 100% of the credit risk related to those loans. The loans that Mid-Coast selected for the swap included high quality mortgage loans that fell into two primary categories of concentration: the customers who were primarily raising horticultural or vegetable crops and customers in the large borrower portfolio. These were two categories in which loan growth had created concentrations that required active portfolio management. The fact that the farm real estate loans that Mid-Coast submitted for the swap were high quality loans indicates that the objective of the swap was not to reduce the level of weak credits (i.e., reduce transaction risk), rather it was to reduce concentration risk and ameliorate the capital constraint.

The swap allowed Mid-Coast to substitute the AMBSs for the farm real estate loans, thus reducing the regulatory capital requirement of the association, while maintaining the customer relationship on the swapped loans. The reduced capital requirement in this case can be translated into the net cost of the swap. Based on the notional principal value of $60 million, the reduction in capital requirements is from 8% with a 100% risk weight on the real estate loans to a 20% risk weight on the AMBSs. The reduction in capital requirement is 6.4% (.08 * (1.0 - 0.2)), which translates into $3.84 million in additional capital for the association. Assuming a marginal cost of debt of 6% and a marginal cost of equity of 16% for the association, the savings on the cost of funds is 10% due to the conversion of higher cost equity capital to lower cost debt. Thus, the savings due to the swap is 64 basis points (.064 * .10). Assuming the association initially maintained a 250 basis point spread on its real estate loans, and that the FarmerMac fee is 80 basis points per year, the net cost of the swap is just 16 basis points per year (250 –(250-80+64)). An additional consideration for Mid-Coast is that the association can unwind the swap relatively easily. Although the swap is for the life of the loans, the association retained the option to buy back the loans from FarmerMac at any time prior to maturity.

Conclusions

In response to a changing risk environment, bankers are taking a more strategic portfolio management approach. Strategic loan portfolio management is a forward-looking process that integrates lender priorities and credit culture with the technical aspects of credit administration (risk identification, measurement and monitoring), internal controls that attempt to maximize expected earnings at acceptable levels of loan portfolio volatility, and capital adequacy constraints. Credit models are recent innovations that have become an integral part of strategic

22 Regulatory risk refers to the likelihood that a cyclical deterioration of credit quality will result in a higher equity capital requirement and the regulator will restrict the volume of loans that the lender can book due to a finite amount of capital.

portfolio management because of their facility for predicting and/or monitoring changes in portfolio credit quality. Some models are relatively sophisticated representations of portfolio credit risk that rely on market indicators of asset value and assumptions about the distribution of default rates as an aid in quantifying the risk exposure. Due to a lack of available information, many agricultural lenders and smaller commercial banks are not able to simply apply these credit models. However, they can benefit from adapting the principles that underlie these models (along with the use of traditional credit analysis). In this regard, loan risk-rating information plays a central role in all portfolio credit models, regardless of their level of sophistication.

Our primary objective has been to explore the framework for strategic loan portfolio management in agriculture. The emphasis has been on the concepts and tools for identifying and quantifying credit risk at the portfolio level. To illustrate the concepts and the measures of credit risk we used the approach suggested by McKinley and Barrickman to decompose credit risk into three measurable elements. We also evaluated the impacts of selected strategic portfolio management decisions on the risk profile of an agricultural lender using that approach. We extended that approach to measure the impacts of changing credit risk exposure on the risk-adjusted performance of the lender and the implications for the strategic management of capital. The information generated through this process appears to be quite useful to agricultural lenders who desire either to quantify their portfolio risk for the purpose of monitoring changes in their credit risk profile, or to establish limit systems as part of a more active loan portfolio management strategy.

The quantification of risk and the setting of risk limits are an integral part of active loan portfolio management. There are two basic active portfolio management alternatives for a lender to consider - either sell the loans (and remove them from the balance sheet) or retain the loans, but alter their default risk characteristics. We have explored loan sales, risk management participations and credit derivatives. From a strategic loan portfolio management perspective each method offers some scope for altering the transaction, intrinsic and concentration risk profiles of an agricultural lender. Financial markets provide alternatives for selling loans into the secondary market, yet agricultural lenders are increasingly looking for ways in which to maintain the loans on their books (and the customer relationship), while managing the operational and regulatory risks and capital requirements. In order to accomplish this strategic objective, they could develop risk management participation arrangements or use credit derivatives. While credit derivatives are still relatively new financial innovations, the use of credit swaps and long-term standby agreements (which contain option-like features) on agricultural real estate loans is increasing through the Federal Agricultural Mortgage Corporation.

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Table 1. Identifying the Portfolio Credit Risk Profile

Risk Component	Characteristics
Transaction Risk	Credit classification (A-1, A-2, ... , A-4, OAEM, etc.) Risk rating/score (2.50, ... , 8.00) Weight (1.00, ... , 1.50) Outstanding portfolio (% by credit classification)
Intrinsic Risk	Industry (dairy, grain, hogs, etc.) Line of business (operating, mortgage, leases, etc.) Farm involvement (full-time, part-time, farm-related business, processing/ marketing, etc.)
Concentration Risk	Largest industry (% of capital) Largest line of business (% of capital) Largest type of farm involvement (% of capital) Largest borrowers (e.g., ten largest)

Table 2a. Industry Intrinsic Risk Scoring Worksheet

HISTORICAL RISK ELEMENTS	*Degree of Risk*			
	N/A	Low	Mod	High
1) FINANCIAL PERFORMANCE - Earnings/margins - magnitude, trends, volatility - Sales - magnitude, trends, volatility - Cash flow strength; debt/fixed charge coverage				
2) FINANCIAL STRUCTURE - Liquidity, leverage & Cost structure, ability to control cost - Asset quality				
3) STABILITY/LONGEVITY - Track record - length & strength & Position in life cycle - Volatility - stable or major change; failure rate of companies				
PREDICTIVE RISK ELEMENTS				
4) STRUCTURE/DIVERSITY - Size/diversity (core of solid cos. or many small ones) - Strength and influence of customers and suppliers - Ease of entry				
5) PRODUCT/SERVICE - Obsolescence factor/average life cycle - Stable product or fad (elastic or inelastic demands) - Availability of alternatives to this product/service				
6) COMPETITIVE FACTOR - Highly competitive/predatory pricing - Rational competitive/rational pricing - Competitive pressure on pricing and margins				
7) POLITICAL/REGULATORY/TAX - Degree and trend of regulation/deregulation; government stability - Legal restrictions (i.e. tax laws/real estate business) - Tariffs/quotas/policies (EPA, CRA, autos, peanuts, etc.)				
8) ECONOMIC VULNERABILITY - Degree of cyclicality with overall economy - Ability to withstand recession - Dependence on or impact of interest rates				
9) ENVIRONMENTAL/NATURAL - Effect of weather (drought, freeze, etc.) - Effect of natural disasters (earthquakes, floods, etc.)				
10) COVARIANCE/EXTERNAL FACTORS - Correlation with performance of other industries - Other external factors not previously covered				
LENDING RISK ELEMENTS				
11) COLLATERAL - Liquidity of collateral, breadth of market, ease of conversion - Carrying cost, ease of identifying & locating collateral - Stability of collateral value, vulnerability of disputes				
12) TERM/TYPE - Short, medium, long term - Monitoring requirements/documentation risk				
INDUSTRY RATING				
SCORE / CATEGORY	Sum X(-1)	Sum X(-1)	Sum X(0)	Sum X(2)
0 - 18 GREEN				
19 - 30 AMBER	TOTAL=		Plus 24	
31+ RED	INDUSTRY RATING:			

Table 2b. Line of Business Risk Scoring Worksheet

HISTORICAL RISK ELEMENTS	*Degree of Risk*			
1) CREDIT PERFORMANCE --- Past levels of delinquencies, losses, loan performance --- Degree of volatility in credit performance	N/A	Low	Mod	High
2) LINE OF BUSINESS STABILITY/LONGEVITY --- Growth characteristics (high, low, moderate, uneven) --- Duration and stability of LOB track record --- Degree of change in LOB lending practices/procedures	N/A	Low	Mod	High
PREDICTIVE RISK ELEMENTS	*Degree of Risk*			
3) CUSTOMER RISK/PROFILE --- Diversity/financial strength of customer base --- Payment histories, bankruptcy levels	N/A	Low	Mod	High
4) ECONOMIC VULNERABILITY --- Susceptibility to economic swings --- Effect if recession, interest rates, localized weakness	N/A	Low	Mod	High
5) COMPETITIVE FACTORS --- Reasonability of pricing margins and profitability --- Pressure to make accommodations on terms, advance rates, documentation, pricing, etc.	N/A	Low	Mod	High
6) POLITICAL/REGULATORY/TAX ISSUES --- Degree of impact from EPA, deregulation, tax law, etc. --- Vulnerability to changes in political policies (defense)	N/A	Low	Mod	High
7) COVARIANCE --- Impact from a single employer/industry/external factor (i.e. reliance on oil industry, military base, auto industry)	N/A	Low	Mod	High
8) NATURAL/ENVIRONMENTAL IMPACT --- Susceptibility to drought, freeze, flood, etc.	N/A	Low	Mod	High
LENDING RISK ELEMENTS	*Degree of Risk*			
9) COLLATERAL --- Liquidity of collateral, breadth of market --- Carrying costs, ease of identifying & locating collateral --- Stability of collateral value, vulnerability to disputes --- Ease of collateral conversion	N/A	Low	Mod	High
10) TERM/TYPE --- Short, medium, long term --- Balloons, bullets --- Monitoring requirements --- Documentary risk (FCA, FSA, SBA, participations)	N/A	Low	Mod	High
LINE OF BUSINESS RATING				
SCORE CATEGORY	Sum X(-1)	Sum X(-1)	Sum X(0)	Sum X(2)
0 - 15 GREEN				
16 - 25 AMBER	TOTAL =		Plus 20	
26+ RED	LO RATING:			

Table 3. FirstAg Portfolio Risk Profile - 1997

Capital	53,301,321	ROA	1.40%	Ten Largest Customers	30,407,590

Transaction Risk Profile

Credit Classification	Risk Rating	Risk Weight	Percent Volume	Dollar Volume	Weighted Scores
Acceptable	1.00	1.00	14.9%	66,230,775	0.15
Acceptable	2.00	1.00	24.7%	109,556,897	0.49
Acceptable	3.00	1.00	31.4%	139,494,062	0.94
Acceptable	4.00	1.00	22.7%	100,627,232	0.91
OAEM	5.00	1.05	3.1%	13,966,525	0.17
Sub-Viable	6.00	1.15	1.2%	5,261,118	0.08
Sub-Nonviable	7.00	1.25	2.0%	9,019,160	0.18
Doubtful	8.00	1.50	0.0%	21,912	0.00
Weighted Average Risk Score (WARR)			100%	444,177,680	**2.92**

Transaction Risk Profile Points **23.5**

WARR	Profile Points	Risk Level
1.00 to 2.35	5.0 - 15.0	Low
2.36 to 3.25	15.1 - 30.0	Moderate
3.26 to 4.00	30.1 - 45.0	High

Intrinsic Risk Profile

Industry	Intrinsic Risk Score	Percent Volume	Weighted Scores
CashGrain	23	40.1%	9.2
Dairy	23	19.6%	4.5
Swine	30	21.6%	6.5
Cattle	36	3.6%	1.3
Poultry	23	2.6%	0.6
Potatoes	36	0.4%	0.2
Others	23	12.0%	2.8
Industry Intrinsic Score		100.0%	**25.0**

Line of Business	Intrinsic Risk score	Percent Volume	Weighted Scores
Operating	23	15.3%	3.5
Intermediate	21	25.8%	5.4
Ag Mortgage	21	54.1%	11.4
Rural Residence	13	4.7%	0.6
Leases	25	0.0%	0.0
Others	23	0.0%	0.0
Line of Business Intrinsic Score		100.0%	**20.9**

Intrinsic Risk Profile

Farm Involvement	Intrinsic Risk score	Percent Volume	Weighted Scores
Full-time	23	78.0%	17.9

Part-time	16		6.9%	1.1
Landlord	19		4.8%	0.9
Rural Resident	13		1.6%	0.2
Farm Related Business	26		0.4%	0.1
Processing & Marketing	27		0.6%	0.2
Others	23		7.8%	1.8
Farm Involvement Intrinsic Score			100.0%	**22.2**

Intrinsic Risk Profile Points **20.8**

Risk Score	Profile Points	Risk Level
0.0 to 17.5	0.0 - 15.0	Low
17.6 to 27.5	15.1 - 30.0	Moderate
27.6 to 37.5	30.1 - 45.0	High

Concentration Risk Profile

Largest Industry	Volume	Percent of Capital
CashGrain	40.1%	334.5%

Industry Risk Profile Points **32.6**

Industry Percent	Risk Profile	Risk Level
0 to 200	0.0 - 15.0	Low
201 to 300	15.1 - 30.0	Moderate
301 to 500	30.1 - 45.0	High

Largest Line of Business	Volume	Percent of Capital
Ag Mortgage	54.1%	451.0%

Line of Business Risk Profile Points **41.3**

LOB Percent	Risk Profile	Risk Level
0 to 200	0.0 - 15.0	Low
201 to 300	15.1 - 30.0	Moderate
301 to 500	30.1 - 45.0	High

Concentration Risk Profile

Largest Farm Involvement	Volume	Percent of Capital
Full-time	78.0%	649.6%

Farm Involvement Risk Profile Points 45.0

Involvement Percent	Risk Profile	Risk Level
0 to 200	0.0 - 15.0	Low
201 to 300	15.1 - 30.0	Moderate
301 to 500	30.1 - 45.0	High

Largest Borrowers	Volume	Percent of Capital
Ten Largest	30,407,590	57.0%

Largest Borrower Risk Profile Points 17.2

Borrower percent	Risk Profile	Risk Level
0 to 50	0.0 - 15.0	Low
51 to 100	15.1 - 30.0	Moderate
101 to 150	30.1 - 45.0	High

Total Concentration Risk Profile Points **30.4**

Composite Risk Profile

Transaction Risk Profile Points	**23.5**
Intrinsic Risk Profile Points	**20.8**
Concentration Risk Profile Points	**30.4**
Composite Risk Profile Points	**74.6**

Composite Risk Score	Composite Risk Profile
10 - 50	Conservative
51 - 75	Managed
Over 75	Aggressive

Table 4. FirstAg Portfolio Risk Profile - 1997

Transaction Risk Profile	Moderate
Transaction Risk Profile Points	**23.5**

Intrinsic Risk Profile	Moderate
Industry (Ag Product)	25.0
Line of Business (Loan Type)	20.9
Farm Involvement	22.2
Intrinsic Risk Profile Points	**20.8**

Concentration Risk Profile	High
Industry	32.6
Line of Business	41.3
Farm Involvement	45.0
Borrower	17.2
Concentration Risk Points	**30.4**

Composite Risk Profile	Managed
Composite Risk Profile Points	**74.6**

Performance Indicators

Capital ($)	**53,301,321**
Capital (%)	**12.00%**
Economic Capital ($)	**50,182,501**
Economic Capital (%)	**11.30%**
ROA	**1.40%**
RORAC a)	**12.39%**
Economic Profit b)	**196,587**
RAROC c)	**0.37%**
RARORAC d)	**0.39%**

a) RORAC = % ROA / % Econ. Capital

b) Econ. Profit = ROA*Vol.-.12*Econ. Capital

c) RAROC = Econ. Profit/Capital

d) RARORAC = Econ. Profit/Econ. Capital

Trans. Risk Cap. ($)	**36,438,843**
Trans. Risk Cap. (%)	**8.20%**
RORAC e)	**17.07%**

e) RORAC = % ROA / %Trans. Risk Capital

Table 5a. Risk Migration for All Risk-Rated Loans in FirstAg Association, 1997-1998. a/

Risk Rating	A-1 (%)	A-2 (%)	A-3 (%)	A-4 (%)	M-5 (%)	S-6 (%)	S-7 (%)	D-8 (%)	Paid (%)
A-1	51.0	13.4	4.6	11.6					19.1
A-2	7.8	52.7	19.2	5.4	1.0		0.4		13.1
A-3	1.8	3.7	58.8	17.1	1.3	0.4	0.9		14.9
A-4	0.1	0.4	8.9	64.5	4.1	6.0	1.8		12.9
M-5			1.4	14.3	62.7	0.7	4.0		15.3
S-6				0.8	4.8	44.3			43.8
S-7				1.4			64.0		35.1
D-8								2.7	97.3

a/ Row percentages may not sum to 100%, since loans that are not risk-rated are not shown.

Table 5b. Risk Migration for Swine Producers in FirstAg Association, 1997-1998. a/

Risk Rating	A-1 (%)	A-2 (%)	A-3 (%)	A-4 (%)	M-5 (%)	S-6 (%)	S-7 (%)	D-8 (%)	Paid (%)
A-1	23.4	12.9	4.7	31.8					27.0
A-2	5.4	42.8	33.8	1.1	3.5		1.1		12.1
A-3	0.8	1.7	49.5	26.8	0.7	1.3	1.8		14.6
A-4	0.1	0.1	9.4	54.0	5.6	13.9	3.3		11.6
M-5				2.9	62.0	2.0	10.1		18.2
S-6						77.7			22.3
S-7				1.2			43.8		55.0
D-8									

a/ Row percentages may not sum to 100%, since loans that are not risk-rated are not shown.

Table 6. FirstAg Portfolio Risk Profile -1998

Transaction Risk Profile	Moderate
Transaction Risk Profile Points	**26.5**

Intrinsic Risk Profile	Moderate
Industry (Ag Product)	27.6
Line of Business (Loan Type)	24.4
Farm Involvement	24.1
Intrinsic Risk Profile Points	**24.5**

Concentration Risk Profile	Moderate
Industry	24.4
Line of Business	33.1
Farm Involvement	45.0
Borrower	20.0
Concentration Risk Points	**27.3**

Composite Risk Profile	Aggressive
Composite Risk Profile Points	**78.2**

Performance Indicators

Capital ($)	**75,037,291**
Capital (%)	**12.56%**
Economic Capital ($)	**71,285,427**
Economic Capital (%)	**11.93%**
ROA	**1.35%**
RORAC a)	**11.31%**
Economic Profit b)	**(489,253)**
RAROC c)	**-0.65%**
RARORAC d)	**-0.69%**

a) RORAC = % ROA / % Economic Capital
b) Econ. Profit = ROA*Vol.-.12*Econ. Capital
c) RAROC = Econ. Profit/Capital
d) RARORAC = Econ. Profit/Econ. Capital

Trans. Risk Cap. ($)	**51,798,001**
Trans. Risk Cap. (%)	**8.67%**
RORAC e)	**15.57%**

e) RORAC = % ROA / %Trans. Risk Capital

Table 7. FirstAg ACA Portfolio Risk Profile -1998 (Discount)

Transaction Risk Profile	Moderate
Transaction Risk Profile Points	**27.5**

Intrinsic Risk Profile	Moderate
Industry (Ag Product)	27.2
Line of Business (Loan Type)	24.5
Farm Involvement	24.0
Intrinsic Risk Profile Points	**24.3**

Concentration Risk Profile	Moderate
Industry	21.5
Line of Business	30.1
Farm Involvement	45.0
Borrower	20.0
Concentration Risk Points	**25.8**

Composite Risk Profile	Aggressive
Composite Risk Profile Points	**77.6**

Performance Indicators

Capital ($)	**75,037,291**
Capital (%)	**13.96%**
Economic Capital ($)	**65,285,427**
Economic Capital (%)	**12.15%**
ROA	**1.35%**
RORAC a)	**11.11%**
Economic Profit b)	**(578,855)**
RAROC c)	**-0.77%**
RARORAC d)	**-0.89%**

a) RORAC = %ROA / %Econ. Capital

b) Econ. Profit = ROA*Vol.-.12*Econ. Capital

c) RAROC = Econ. Profit/Capital

d) RARORAC = Econ. Profit/Econ. Capital

Trans. Risk Cap. ($)	**47,448,001**
Trans. Risk Cap. (%)	**8.83%**
RORAC e)	**15.29%**

e) RORAC = %ROA / %Trans. Risk Capital

Note: Sold $60 million in loans. Description: $15 million in each of classes A-1, A-2, A-3, A-4; all full-time farmers; 1/2 swine loans and 1/2 cash grain loans; 1/2 mortgages and 1/2 intermediate term loans.

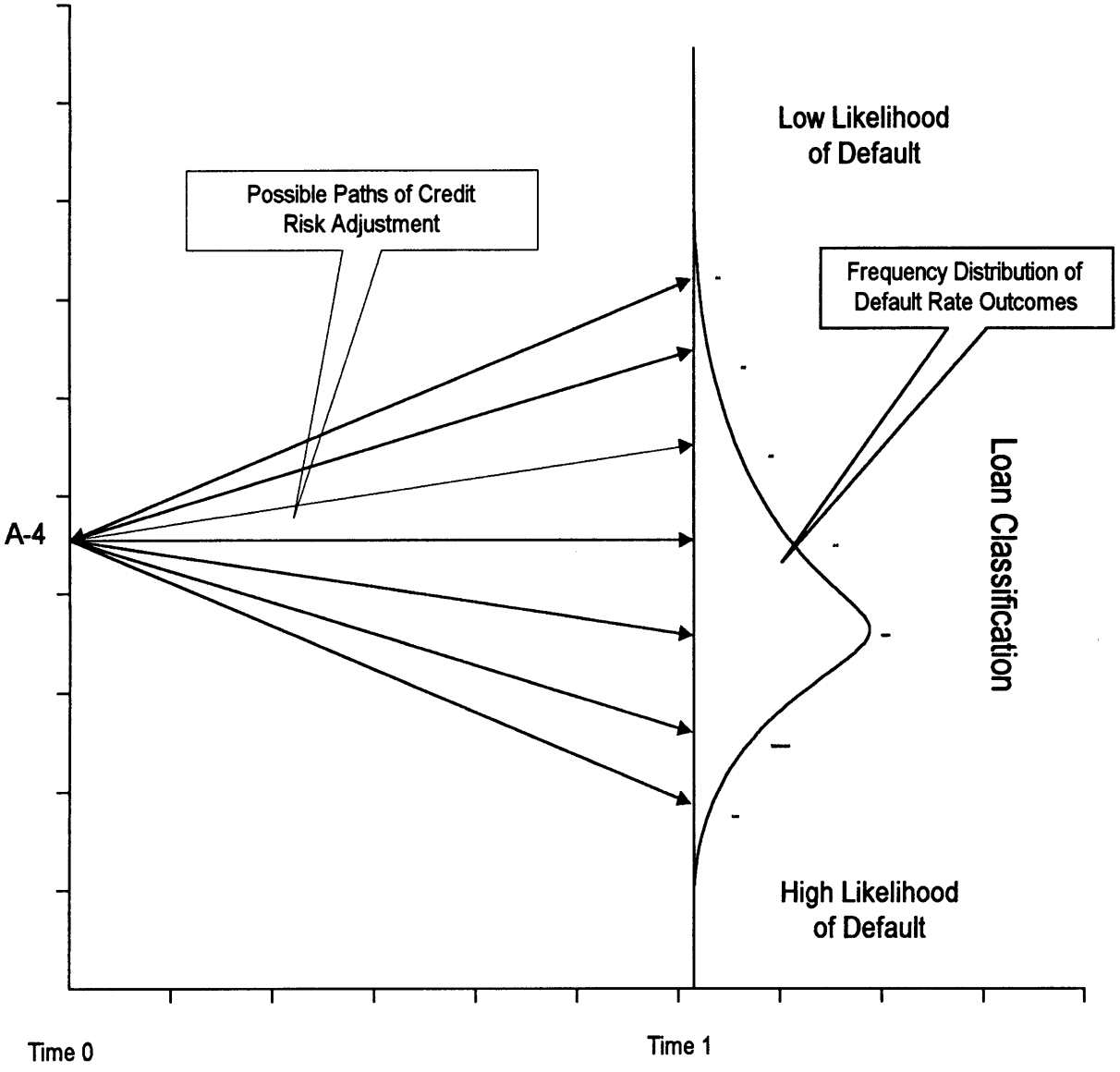

Figure 1. Credit Risk Migration - A Deterioration Scenario

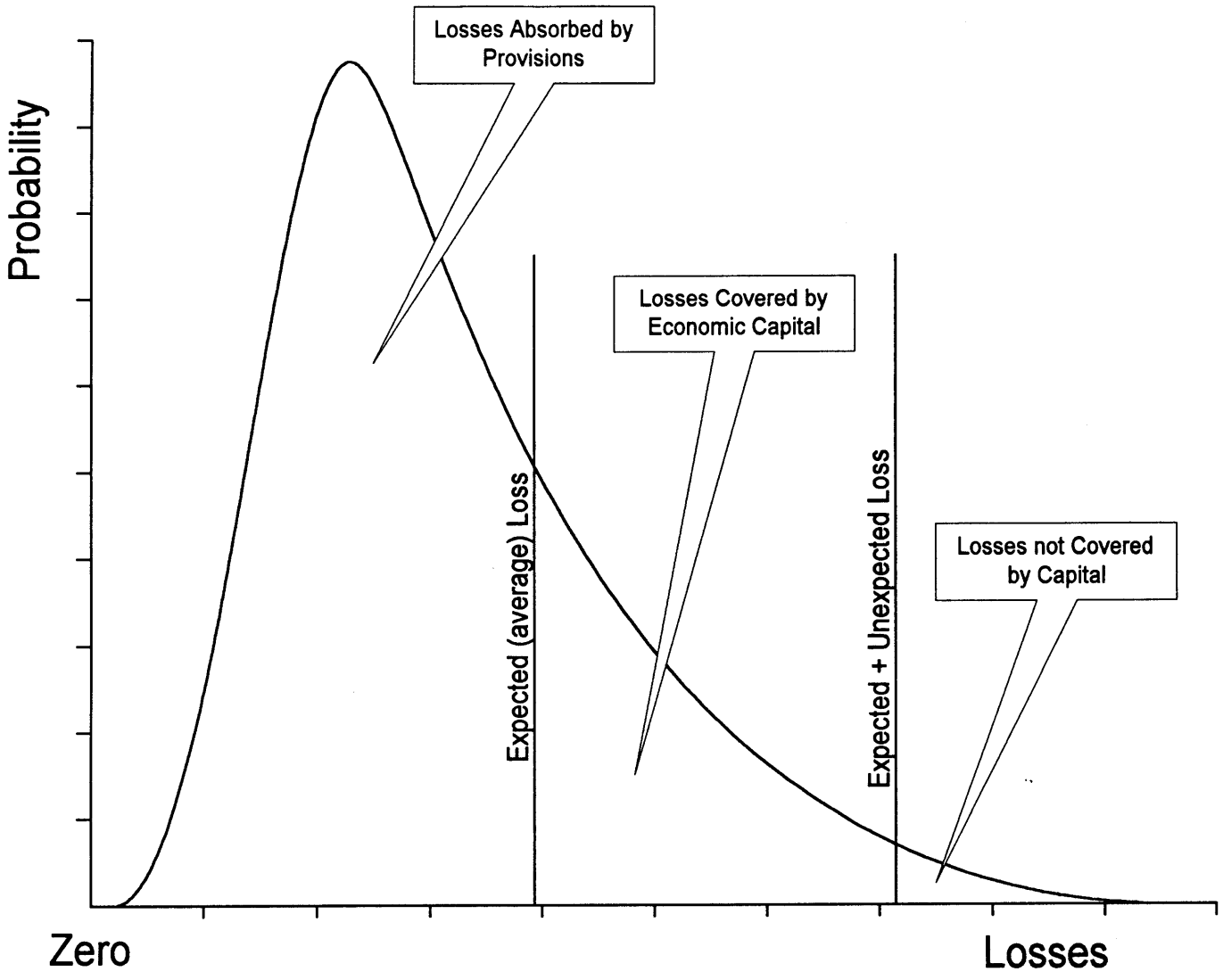

Figure 2. Portfolio Losses and Economic Capital

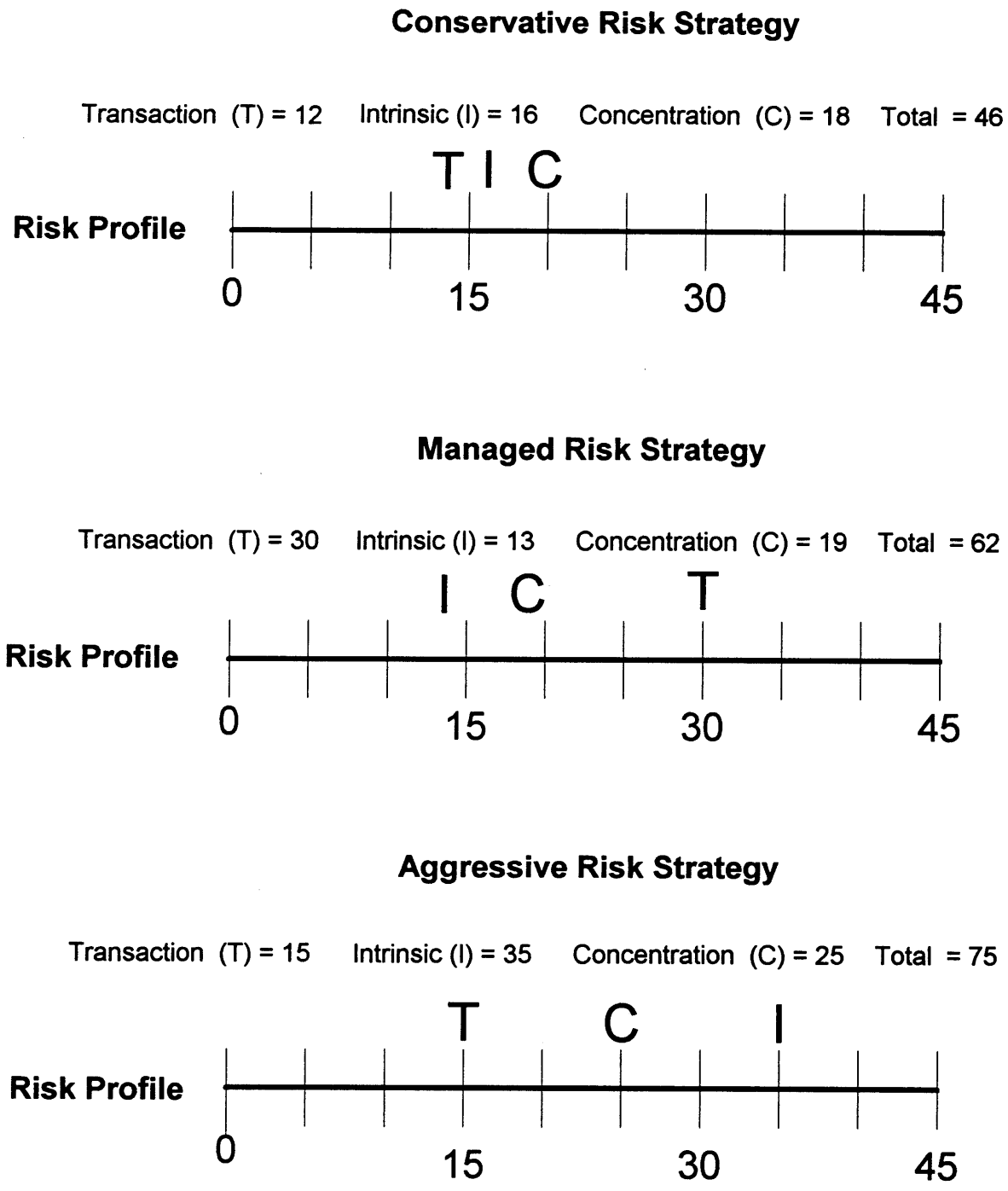

Figure 3. Illustration of Three Bank Risk Strategies
(Adapted from Barrickman)

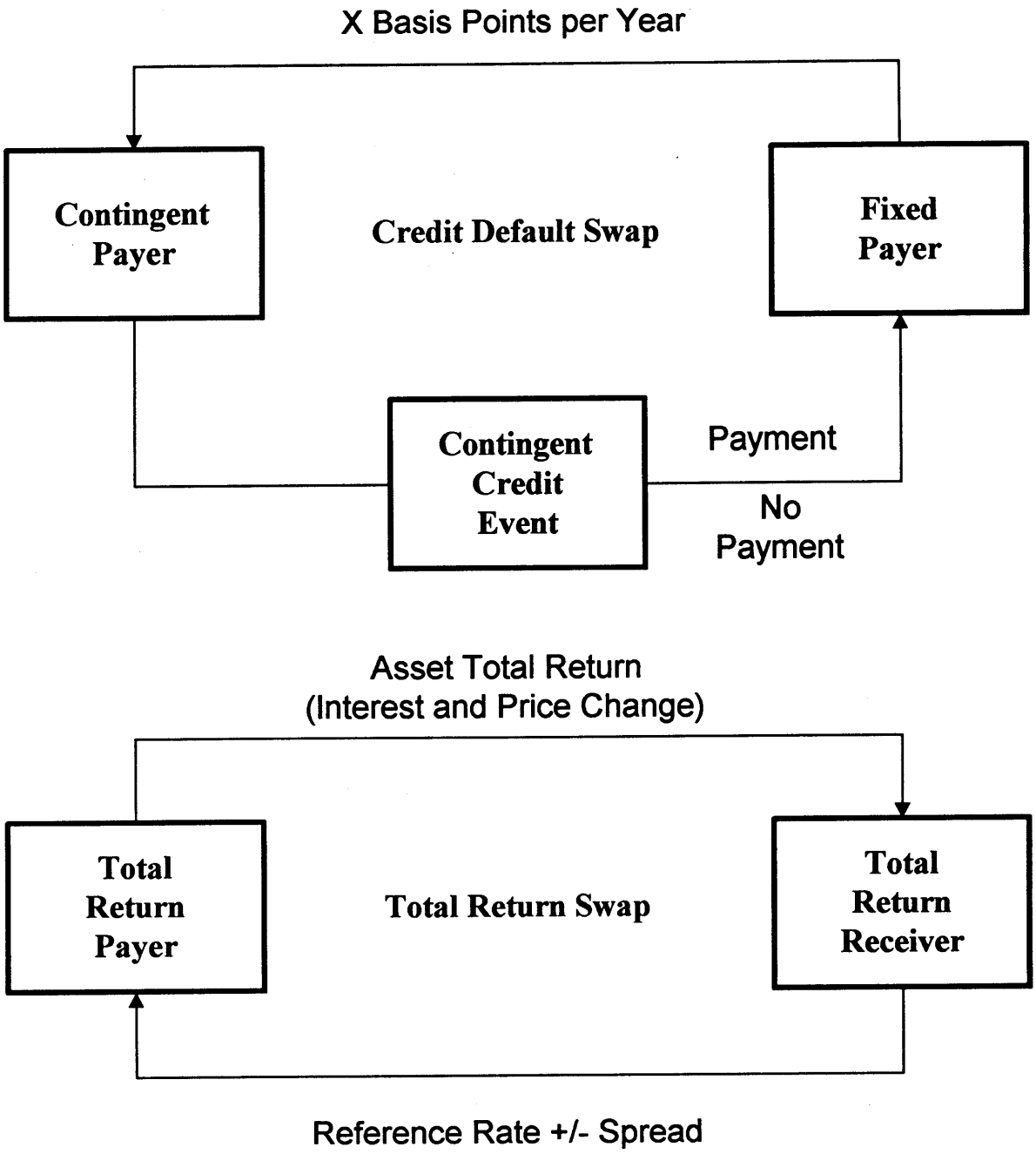

Figure 4. Structure of Credit Derivatives