Maintaining the Cutting Edge

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THE LINKAGE OF APPLIED FINANCIAL ANALYSES AND CREDIT SCORING TO EXTENSION AND TEACHING PROGRAMS

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The changing agricultural environment will make educational programs pertaining to the management of credit imperative for both the farmer and lender.

Research has been conducted at Virginia Tech predicting the repayment ability and financial condition of borrowers from commercial banks, farm credit system, and Farmers Home Administration.

Factors that were found to be significantly related to repayment of a loan account were: percent equity or debt to asset ratio, current debt ratio, cash expense - cash receipt ratio excluding interest and depreciation and cash flow coverage ratio.

Results were extended in 25 seminars and schools with lenders and producess state and nationally. Written articles have been developed for industry jounals and popular publications.

Domestic and global factors in agriculture and the general economy are impacting the profitability and structure of agriculture. Farm numbers, in all likelihood, will continue to decline with a strong probability to a bimodal agricultural sector composed of a segment of larger commercial farms in prime agricultural areas and smaller part-time farms in locations that provide employment opportunities.

The changing agricultural environment will make careful management of credit imperative for both the farmers and lenders; the challenge is to develop approaches to serve a diversified agricultural structure with a sophisticated set of needs.

Historically, land grant universities have played a significant role in agricultural credit pertaining to research, extension, and teaching programs. However, one of the difficulties has been that efforts have lacked continuity in disseminating and implementing new techniques and discoveries from agricultural credit research to Extension and teaching programs. Research has frequently been criticized as being too abstract or not timely enough to meet critical problems. The communication process was also hindered in some cases when the research fails to go beyond a thesis or research journal, thus never reaching the application process in Extension programs and the classroom.

In the future land grant university professionals need to be cognizant of the rapidly changing agricultural environment and play a

significant role in linking research in agricultural credit to Extension and university teaching programs. It will be imperative that agricultural lenders, farmers and agri-professional and undergraduate students be abreast of the latest research and techniques for implementation of research so that proper credit decisions can be made.

Objectives of Paper

Research and Extension work that has been conducted in the areas of agricultural financial statements has largely pertained to farm record systems development and a refinement of accounting procedures for the basic financial statement preparation. The complexity of the recent farm crisis and transition has demonstrated a greater need not only for elaborate financial records, but also methods for their analysis.

Successful systems or models which predict financial strength have not been developed previously for assorted reasons. Poor recordkeeping and financial information makes extensive analysis of most loan accounts difficult. Lenders have also used varied lending analysis techniques as well as accounting systems. Diversity in crop and livestock enterprises and factors such as weather and markets and other externalities have plagued agrilenders and farmers in credit analysis techniques.

Two research projects at Virginia Tech, one which is completed and one that is in the process, have been conducted using data from commercial banks, Farm Credit System, and Farmers Home Administration in predicting repayment ability and financial strength of their borrowers. The ultimate goal was to assure that the research was utilized in state and national Extension and university teaching programs. The specific objectives of this paper will be to:

1. Discuss the study and how it was conducted.
2. Introduce basic results and analysis.
3. Reveal how study results have been utilized in Extension and teaching programs.
4. Discuss modifications that have been made to program subject matter and the linkage of future research and Extension projects.

The Study Objectives, Data, and Procedures

The primary objective of the study was to determine what factors will significantly predict financial strength and weaknesses of individual loan accounts. Each study analyzed the weaknesses and discrepancies of previous research and develop a model that would effectively aid lenders in making initial credit decisions and in monitoring portfolios.

Data used in the study that was completed are from agricultural loan accounts that were originated from 1980 to 1985. Data were obtained using surveys sent to various commercial banks, Farm Credit Associtaions, and FmHA offices. Loan officers randomly selected both

delinquent and non-delinquent accounts and provided balance sheet information for each account. Borrower and farm characteristics and repayment status were also included in the data requested and obtained.

The sample survey included 382 loan accounts with 16 percent from commercial banks, 62 percent from Farm Credit Associations, and 22 percent from FmHA. Approximately 20% or 73 of the loan accounts had become delinquent, while the remaining 309 had remained on current status.

Thirty percent of the loans analyzed were from primarily crop operations, i.e. grains, tobacco, etc., while 18 percent represented primarily dairy farms. Thirty percent were classified as mixed livestock farms, beef cow calf, feeder cattle, hogs, while the remainder were very diversified encompassing farm operations ranging from fruits and vegetables to forest products. Non-farm income was verified on 70 percent of the loans with Farm Credit and commercial bank customers reporting the largest amounts. Twenty-five percent of the account generated more than $250,000 gross farm income while 25 percent reported between $100,000 and $250,000. At the other end of the spectrum, 20 percent had under $10,000 gross farm earnings; 30 percent were between $10,000 and $100,000 annually.

Through the review of literature, participation in Extension meetings and seminars and informal conversation with agrilenders, the most widely used ratios and variables for determining repayment ability were listed and analyzed for each loan. Since the dependent variable (delinquency) was dichotomous in nature, a qualitative choice model was used. The probit model was used by choice, as a study by Capps and Kramer concluded that the probit and logit models yield similar results.

Results

A number of factors were found to significantly produce repayment of a loan account. Significant ratios were: percent equity or debt to asset ratio, current debt ratio, cash expense cash receipt ratio excluding interest and depreciation, and the cash flow coverage ratio. Table 1 illustrates the means of delinquent and non-delinquent accounts for these factors. In terms of magnitude of significance, the percent equity or debt to asset ratio was ascertained to be the most significant and affected the probability of delinquency the greatest.

Table 1. An Economic and Financial Profile of Non-Delinquent and Delinquent Loan Accounts, 382 Loan Accounts From Virginia Agrilenders, 1980-85.

Factor or Ratio	Account Status: 309 Non-Delinquent	73 Delinquent
	Percent	
Debt to Asset Ratio	61	39
Current Debt Ratio	18	23
Cash Expense - Cash Receipt Ratio (Excluding Interest and Depreciation)	71	82
Cash Flow Coverage Ratio	42	.006

Other variables, found significant, that described certain characteristics of a farming operation included: number of credit lines or sources of credit; an operation that reported a diversified set of enterprises; loans made by Farm Credit or FmHA; and an operation with a gross farm income of less than $10,000. The model indicated that as a number of creditors increased for an applicant, the chance of delinquency decreased. An explanation for this was that the loan applicant was using money from one creditor to repay another. According to the models, the probability of delinquency decreases if the operation has more diverse enterprises. There was also less chance of delinquency if the loan was made by Farm Credit with loans being made by FmHA having the greatest probability of delinquency. The remaining significant variable indicated that an operation with a gross farm income less than $10,000 had less chance of becoming delinquent because of the prominence of stable non-farm income respective to the size of the farm operation.

According to the model, a profile of a borrower with high risk of repayment problems would operate a large commercial farm operation with little diversity, small amounts or no reported non-farm income, high debt to asset ratios, low cash flow coverage ratios along with high current debt and cash expense - cash receipt ratios excluding interest paid.

The results of the study proved that certain ratios and descriptive characteristics of an operation are significant in determining the probability of a loan becoming delinquent. However, it was not concluded that the ratios found not to be significant in this study should not be used in determining whether an applicant receives a loan. The analysis and study was completed in an effort to objectively aid lenders in making loan decisions during volatile and transitional times in agriculture, not make the decision for them.

The linkage of this research project to state and national Extension and teaching programs has been vital, particularly to the recent farm financial crisis. As previously mentioned through the review of literature, Extension meetings, and seminars, ratios and

variables were identified for determining the repayment ability of a loan. The research that was completed tested these ratios and assisted in refining the importance of each in the analytical aspects of farm financial statements. The financial analysis information has been very useful in Extension programs with agrilenders, farmers, Extension clientele, regulatory agencies and the undergraduate classroom. The information has been disseminated in a series of articles in agrilending journals, popular farm press, and textbooks for agrilenders and undergraduates.

Instruction Programs

The financial analysis data has been extremely important in agrilending schools and seminars. In the past 18 months, 25 Extension seminars and schools have been conducted state and nationally concerning the use of farm financial statement analysis.

Examples of schools and seminars have been the Virginia and Southeastern Agrilenders Schools, State Banking Schools in Arkansas, Illinois, Kansas, Kentucky, Maryland, Nebraska, New Mexico, New York, North Dakota, Pennsylvania, and South Dakota. Research information has been used at the Advanced National Agricultural Bank Management School, as well as Farm Credit and FmHA training programs.

Participants are introduced to the basic ratios and variables through six to twelve hours of lecture based around a real life case study. For each ratio and factor risk assessment is presented. For example, for the debt to asset ratio a ratio of less than 30 percent would be considered little risk, 30 to 60 percent moderate risk, and over 60 percent high risk. This is illustrated through the stop light concept, i.e. green light -- low risk, yellow light -- moderate risk, red light -- high risk, Appendix A. This tool has been very useful in motivating seminars and school participants in retaining information. Agrilenders are encouraged to use ratios and variables together and not isolate just one factor. Financial analysis for specific enterprises and agrilenders is left up to the responsibility of participants as research data has not been refined for enterprise or lender specific in most cases. Once the lecture is completed, participants are required to analyze another case study or visit a farm situated problem if available. This reinforces the concepts and principles of financial analysis and further assures that the students have a grasp of how the variables can be applied. If time permits, it has been found quite useful to ask students to take an exam pertaining to financial analysis to assess the instructor's abilities in presenting the materials.

The agrilender participants have been encouraged to use the application of financial analysis data for the screening of the initial applicant, portfolio analysis, control and management, differential pricing of loans, and problem loan identification and workout. The agrilender group was targeted first in the farm financial crisis and transition because of the multiplier aspect in the dissemination of information. For example, one agrilender may work with 50 to 100 loan

applicants, so information is dispensed and actually used in a much broader context than would be otherwise.

Farm and Extension seminars have been presented in a different context. Generally speaking, because of program format, a much shorter time requirement places constraints on the ability to encourage application in the seminars. In these instances, the ratio and variables are used in a motivational sense and farmers are encouraged to apply it themselves. In some instances follow-up seminars of one or two days have evolved out of the shorter talks, which have been structured simliar to the agrilender seminars.

A series of articles and papers have also been prepared for state and national publications. An article entitled, "The Credit Analysis Scorecard," was featured in the Journal of Agricultural Lending published by the American Bankers Association Agricultural Division. This mode of communication made the results available to agrilenders nationwide, and was 2,000 words in length and illustrated by a case situation. Articles of similar length and format were published in Agrifinance, a popular press publication for agrilenders and agribusinesses. Articles in Successful Farming and Hoard's Dairyman, the national dairy magazines have been or are in the process of being published. This allows for access to farm and Extension groups. A video in cooperation with the Farm Credit System and USDA Cooperative Extension will focus on the use of these ratios and variables in properly using credit. The research project information has been particularly useful in problem loan consultation by our farm management specialists and agents who were trained at our agrilenders schools and called upon to work with farmers and agrilenders in financial crises situations.

Scoring System

A refinement of the financial analysis research data and its application to Extension programs have been the development of a credit scoring system for different agrilenders, Appendix II. The credit scorecard, illustrated in Appendix II, is a refinement of credit analysis with the application of scores to various factors. The scorecard has five sections with points corresponding to the factors of analysis. Larger values were placed on certain sections such as financial condition and repayment ability. That's because research and feedback through application have indicated these areas and factors have a greater impact on loan success. The scoring system acts as a guide to systematically evaluate a loan not to replace the agrilender's judgement. Using the scoring technique, the loan receives a maximum of nine points for repayment ability, 12 points financial condition, six points credit management, six points production management and profitability and three points on the farm and individual. A maximum of 36 points can be obtained and various risk codes are summarized by agrilender type. For example a low risk green loan would require 30 points with Fram Credit and commercial banks but only 25 points with FmHA that frequently deal with the marginal financial situation.

Agrilenders have used this system in initial loan screening, portfolio management, supervision and pricing of loans to farmers. Some lending institutions have reported that they have computerized this scoring technique and modified it to their financial analysis system.

The current research project in process is further refining this scorecard to ascertain whether any new variables be changed or individual sources be modified.

Future Needs and Challenges

We are in a new era in agriculture -- one in which the agrilender and particularly the farmer must redirect the perception of agriculture from primarily a production standpont to include financial terms. Completion and interpretation of financial statements will be essential and teaching efforts will be critical.

The future challenge from an Extension effort will be the progress towards uniform financial statements. Consistent methods of financial statement preparation will allow for more reliable measures and guidelines. The advent of accrual accounting should prove effective in this matter, particularly on commercial farms.

Enterprise and lenders' specific financial analysis is a future thrust of applied Extension work and should be encouraged. Perhaps standards established by Robert Morris Associates and Dunn's and Broad Street Business and financial profile should be a number one priority in linking land grant research in agricultural finance to Extension and teaching programs. This, in turn, would assist agriculturalists in managing their credit more effectively in the current agricultural transition.

APPENDIX I

A Summary of Farm Financial Statement Analysis
"Cash Flow Factors"

1. Debt service (interest and principal and interest on operating money) should not exceed 25 percent of gross farm and non-farm earnings.

   * under 15 percent, green light
   * 15 to 25 percent, yellow light
   * over 25 percent, red light

2. Cash flow coverage ratio (earnings residual/debt service) should exceed a minimum of 10 percent for projection purposes.

   * greater than 30 percent, green light
   * 10 to 30 percent, yellow light
   * less than 10 percent, red light

3. Farm operating expenses/farm earnings ratio (excluding interest and depreciation) should be under 75 percent if large debt loads exist.

   * less than 65 percent, green light
   * 65 to 80 percent, yellow light
   * greater than 80 percent, red light

4. The farm and family business should demonstrate reasonable sensitivity to volatility of outside influences. (Can it meet the following tests?)

   * five percent drop in farm earnings (by production and price declines)
   * five percent increase in farm expenses
   * three percent variance in loans on variable interest rates
   * farm and family business can handle adverse directions in all three areas, green light
   * farm and family business can handle adverse directions in one to three areas, yellow light
   * farm and family business can NOT handle any adverse directions in these areas, red light

Balance Sheet and Equity
"Liquidity and Solvency Factors:

1. Current ratio (current assets/current liabilities) should exceed 1.25 to 1 as for a minimum.

   * greater than 1.5 to 1, green light
   * 1.0 - 1.5 to 1, yellow light
   * less than 1.0 to 1.0, red light

2. Accounts payable ratio (total average extended accounts payable divided by total farm and non-farm earnings).

   * less than 5 percent, green light
   * 5 to 15 percent, yellow light
   * 15 percent or greater, red light

3. Percent equity (total net worth/total assets).

   * over 70 percent, green light
   * 40 to 70 percent, yellow light
   * less than 40 percent, red light

4. Borrowing capacity and reserve in the financial statement, to withstand changes in market values.

   * reserve in all areas, green light
   * reserve in one to three areas, yellow light
   * no reserve, red light

Profitability Analysis

1. Capital turnover greater than farm size and enterprises for the area. (farm assets/farm earnings) = (turnover in years)

   * exceeds that of comparable farm, green light
   * about average, yellow light
   * below average, red light

2. Farm profitability analysis indicating a positive return. (net farm income + interest paid - living expenses/total average value of farm assets)

   * returns greater than interest rate, green light
   * positive return but less than interest rate, yellow light
   * negative return

Code of Risk Potential

Green light "strong prospect": Six to ten green lights

Yellow light "questionable prospect": Four to six green lights

Red light "problems": Under four green lights

APPENDIX II

Credit Risk Scorecard
Risk Scoring for Evaluating Agricultural Credits

		Points
I.	Repayment Ability and Cash Flow (9 points)	
	A. Cash Flow Coverage Ratio	
	Greater than 30 percent	3
	10 - 30 percent	2
	1 - 10 percent	1
	Zero or negative	0
	B. Debt Service Ratio	
	Less than 15 percent	3
	15 - 20 percent	2
	20 - 25 percent	1
	Greater than 25 percent	0
	C. Earnings Expense/Earnings Receipt Ratio Excluding Interest (Historical)	
	Less than 65 percent	3
	65 - 75 percent	2
	75 - 80 percent	1
	Greater than 80 percent	0
	Total Points	___
II.	Financial Condition (12 points)	
	A. Current Ratio	
	Greater than 1.5	3
	1.0 - 1.5	2
	.5 - 1	1
	Less than .5	0
	B. Percent Equity	
	Greater than 75 percent	6
	50 - 75 percent	4
	33 - 49 percent	2
	Less than 33 percent	0
	C. Borrowing Capacity and Reserve	
	Reasonable amounts of reserve in all areas	3
	Reasonable amounts of reserve in two areas	2
	Reasonable amounts of reserve in one area	1
	No reserve	0
	Total Points	___

III. Credit Management (6 points)

A. Credit Lines

Consolidated credit	3
Some split lines of credit	2
Many split lines of credit	1
History many split lines of credit & unsatisfactory payment	0

B. Supplier and Creditor Accounts

No unpaid bills	3
Unpaid bills less than 5 percent of revenue	2
Unpaid bills between 6-10 percent of revenue	1
Unpaid bills over 10 percent of revenue	0

Total Points ___

IV. Production Management and Profitability (6 points)

A. High production and efficiency in top 20% of managers	3
Above average manager but not outstanding	2
Average to slightly below average manager	1
Below average manager	0
B. Returns greater than long run comparable investments	3
Returns positive but less than long run comparable investments	2
Returns positive in the one or two percent range	1
Returns negative	0

Total Points ___

V. Individual and Farm (3 points)

- Goals, records, financial planning, strong farm family background	3
- Some goals and records and financial planning, sound farm and family background	2
- Very few goals and records, doesn't understand financial planning and some farm or personal adversity	1
- Poor attitude, farm and/or personal adversity, doesn't keep or understand records	0

Total Points ___

Point Summary

	Maximum	Farm
Section I	_____	_____
Section II	_____	_____
Section III	_____	_____
Section IV	_____	_____
Section V	_____	_____
Total Points	_____	_____

Commercial Bank & Farm Credit		Farmers Home Administration	
Overall Evaluation	Code*	Overall Evaluation	Code*
30 - 36 points	Green	25 - 36 points	Green
24 - 29 points	Yellow	18 - 24 points	Yellow
18 - 23 points	Orange	12 - 17 points	Orange
Less than 18 points	Red	Less than 12 points	Red

Code Explanation*

Green: This loan is very serviceable and would most likely require minimal supervision

Yellow: This loan is serviceable and would require supervision at least once a quarter

Orange: This loan is questionnable and, if made, would require very close supervision

Red: Reject: If you have one, it may require work-out

THE LINKAGE OF APPLIED FINANCIAL ANALYSES AND CREDIT SCORING TO EXTENSION AND TEACHING PROGRAMS: DISCUSSION

Danny A. Klinefelter

Kohl and Warmann begin by noting the challenge that exists for Extension to develop new approaches to serve its clientele in light of the trend toward a bimodal farm sector. I am in agreement, but am concerned that traditional delivery systems, the farm financial crisis and political pressures will continue to focus Extension's programs and resources on the mid-sized farming operations which are decreasing in both number and economic importance. Such pressures generally have a tendency to create a reactive rather than a proactive approach to adjusting to change. While many of the current programs can be adapted relatively easily to meet the needs of part-time farmers, educational efforts to meet the needs of the emerging commercial sector are going to require a significant upgrading in program breadth and depth. This is particularly true in the areas of business management.

The second point in their introduction refers to the lack of continuity in disseminating new techniques and discoveries from research to Extension and teaching programs. I firmly believe that performance evaluation and reward systems for both Extension and research staff need to place more emphasis on getting the results of applied research published in Extension publications, farm trade publications and/or the popular farm press. The public deserves and should demand more end user oriented dissemination of the results of the research it funds. While not every research project will result in a refereed journal article, it should produce answers or shed light on one or more questions relevant to some segment of the industry. I am not suggesting less emphasis on journal articles, but the requirement for broader dissemination of research results. Kohl and Warmann have done an outstanding job in this regard. In many cases these applied publications would require joint authorship by Extension and research staff which would help to keep open lines of communication as well as providing for the continuing education of the professional staff involved.

In stating the objectives of the paper, the authors point out that the farm credit crisis has demonstrated a greater need not only for better financial information but also for better methods for analysis. While this is true, I want to re-emphasize that most farmers still have a long way to go in terms of recordkeeping, particularly at the enterprise level. Most farmers, lenders, Extension specialists and researchers are still operating in the "garbage-in: garbage-out" stage in terms of analysis because of the lack of adequate, consistently prepared financial information.

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They also note the problems in loan analysis created by enterprise diversity and factors external to the firm. As we have learned from the work on integrated systems approaches to management, strategic planning and expert systems development, effective loan analysis cannot afford to become so myopic in terms of analyzing financial data that it ignores or places too little emphasis on those factors influencing financial performance but not directly reflected in the financial statements themselves. This includes the analysis of both past and projected performance.

The more capital intensive and the more specialized the operation, the more important these "other" factors become. Some of the guidelines that have been developed for producers considering the production of alternative enterprises include many of the factors that need to be considered as we refine our educational efforts in financial analysis and credit scoring. While I cannot list all of the additional factors that need to be explicitly incorporated into credit scoring models, I would like to mention a few:

1. Historical trends in financial indicators in addition to current period values
2. Physical production data - production efficiency and production variability
3. Commodity price - consideration of market cycles and price variability
4. Management quality, succession and depth
5. Changes in capital asset values
6. Changes in government policy - agricultural, fiscal, monetary and trade.

Other market factors should be included in analyzing specific new enterprises and investments; but, the above list is applicable to any farm operation. While Kohl and Warmann's Credit Risk Scorecard reflect some of these variables, others were not addressed.

One additional suggestion is the need to show program participants how the various financial ratios are interrelated and what cause and effect relationships exist. Some "what if" analysis using the DuPont Model would be a good example.

I was particularly glad to see them address the priority that needs to be placed on enterprise specific analysis and the establishment of a set of standard comparisons for agriculture comparable to Robert Morris Associates Annual Statement Studies. A tremendous need exists among producers, lenders and Extension personnel for standards and performance ranges for similar firms against which to compare an individual firm's performance.

They note that their educational efforts were first targeted to agrilenders because of the multiplier effect in the dissemination of the information presented. While I do not question the wider impact of the use of the information by lenders who work with a number of farmers, my own experience leads me to question how often lenders explain or dispense the information to their borrowers. I am not disagreeing with the priority placed on lender education, but rather emphasizing that we should not assume borrowers will learn something just because their

lender knows and uses it.

They also mentioned that research was continuing to ascertain whether variables in the scoring system need to be changed or modified. This needs to be an ongoing effort. However, of equal concern and much less well defined is the need for extensive research and education regarding the weighting schemes and decision rules employed in both credit scoring models and expert systems. Too much is still based on general observation, subjective judgment and the results of limited statistical analyses.

In concluding, I would like to express two cautions which need to be observed by anyone teaching financial analysis to farmers and agricultural lenders. First, we need to be very careful about stating generic rules of thumb when explaining individual ratios. Trends, timing, and specific characteristics of the firm and the industry can change the rules. Second, we need to recognize that frequently even the most commonly used ratios are not well defined or prepared on a consistent basis. The numerator and the denominator of a ratio, as well as the data going into each should always be evaluated for comparability.