

## Credit Quality of Kansas Farms-2016 Data Update

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This article discusses trends in credit quality and the current distribution of credit quality ratings for farms participating in the Kansas Farm Management Association program. Using financial ratios briefly described below, the probability of default for each farm from 1973 to 2016 was computed and summarized. The results indicate that credit quality deteriorated for the second straight year from 2015 to 2016.

In modeling credit risk, financial institutions rely on many measures, including liquidity ratios, profitability ratios, repayment capacity, firm size, and other business performance measures, along with non-economic measures such as character. Typically, a financial institution gives ratings to firms similar to that of a bond index such as the Standard and Poor's (S&P) which, from best to worst, is AAA, AA, A, BBB, BB, B, and CCC.

Using previous research, the probability of default was computed using the following equations:

$$(1) \text{ dv} = -2.3643 - 0.00135 \text{ CDRC} - 0.0217 \text{ OE} - 0.00399 \text{ WC}$$

$$(2) \text{ probability of default} = \{(\exp(\text{dv})) / (1 + (\exp(\text{dv})))\} * 100$$

where *dv* is the dependent variable for the credit scoring regression, CDRC represents capital debt repayment capacity, OE represents owner equity percentage, and WC represents working capital percentage. The capital debt repayment capacity (CDRC) variable was computed using information on repayment capacity, estimated principal and interest payments on term loans, working capital, and capital asset replacement. The working capital percentage (WC) variable was computed by dividing working capital by gross farm income. The relatively large absolute value on the coefficient for OE in equation (1) suggests that this variable is an important determinant of the probability of default.

Average ratio values can be used to illustrate how the probability of default was computed. The average values for CDRC, OE, and WC in 2016 were 38%, 75%, and 46%, respectively. Substituting these values into the equations above would result in a probability of default of 1.45%. Because the distribution of ratings is skewed, the probability of default using the average ratio values is lower than the average rating per farm in 2016 (1.99%). The average values for 2015 were 22%, 76%, and 54% for CDRC, OE, and WC, respectively. These values resulted in a probability of default of 1.39% in 2015 with an average across farms of 1.84.

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Table 1 provides credit quality mapping information. This mapping is used to examine the trends in credit quality and the current distribution of credit quality among farms below.

Figure 1 presents the probability of default for Kansas farms. The graph also illustrates the range of ratings for the B, B+, BB-, and BB rating categories. In 1973, the average rating was BB. From 1974 to 1979, the average rating was a BB-. For most of the next three decades, the average rating was B+. However, the average rating from 1984 to 1986 and for 2002 was a B. From 2008 through 2015 the rating was a BB-. It is important to note that the probability of default in 2014 was the lowest it had been since 1974. The probability of default from 2015 to 2016 increased again for the second year. This occurred due to a decrease in the working capital percentage and the owners' equity percentage. It is important to note that, historically, the probability of default can change rapidly. For instance, the probability of default went from a BB- rating in 1979 to a relatively low B+ rating in 1981.

The distribution of credit quality for Kansas farms for 2015 and 2016 is presented in Table 2. The three highest percentage of farms are in the BB-, BB, or BB+ in both 2015 and 2016 although the percentage fell from 72.6% to 59.2%. The percentage of farms that are rated BBB- or higher increased slightly from 7.1% to 8.4% from 2015 to 2016 due to the high yield during the 2016 growing season. The remaining farms are rated B+ or below. The percentage of farms rated B+ or below increased from 28.3% to 32.5% from 2015 to 2016. In 2014, the percentage of farms with a rating of B+ or below was less than 20%. Firms with a "B" rating are typically assumed to have the capacity to meet credit obligations. However, adverse conditions could impair their ability to meet credit obligations. Firms with a "CCC" rating are vulnerable to nonpayment. The percentage of farms in this category nearly doubled during the last year increasing from 2.5% to 4.8%. Ability to meet credit obligations for these farms depends heavily on business and economic conditions.

The previous measure of default probabilities uses owner's equity percentage and a working capital ratio. An alternative measure is from Moody's Corporation that provides credit ratings and research across alternative debt instruments including approximately 11,000 corporate issuers. Common rating factors that Moody's uses for corporate debt includes scale, business profile, profitability, leverage, financial policy, market position and business risk. The most common sub-factor used to measure leverage is Debt (or Net Debt) divided by Earnings Before Interest Taxes, Depreciation and Amortization (EBITDA). EBITDA is commonly used as a proxy for cash flow being generated by a business prior to debt service and income taxes.

The calculation of Debt to EBITDA ratio is:

$$3) \quad \text{Debt to EBITDA}_n = \frac{\text{Total Liabilities}_n}{\frac{\text{EBITDA}_n + \text{EBITDA}_{n-1}}{2}}$$

A two-year average of EBITDA is used to avoid larger annual swings in income. The Moody's ratings cut-off values used for this analysis are provided in Table 3. Both Kansas Farm Management Association data and data from the USDA are plotted for comparative purposes in Figure 2. The average KFMA farm was near a debt to EBITDA ratio of 2 from 2008 through 2013. In 2014, the debt to EBITDA ratio increased to 2.27. During 2015, the debt to EBITDA ratio increased to 3.63. In 2016, the ratio increased to 5.13. The ratings class fell from Baa to Ba during 2015 and from Ba to B during

2016. The falling incomes have increased this ratio substantially over the last two years. Using all U.S. farms from USDA information, the ratio increase from 2.59 to 3.82 over the two year period. The Kansas situation has deteriorated much quicker than the U.S. as a whole.

Due to differences in relative price, cost, and production trends; credit quality varies by farm type. Table 4 presents the probability of default for common farm types exhibited by KFMA members in 2015 and 2016. The number of farms in parentheses indicates the number of farms of a specific farm type that had data for both years. All farm types saw a deterioration of the probability of default during the year.

Credit ratings, such as those presented in this article, are important for a couple of reasons. First, it is useful to track a credit rating for an individual firm or group of firms over time to ascertain their ability to handle adverse conditions. During 2016, the ability to be able to managed adverse conditions fell for Kansas farms for the second straight year for most farms. Second, interest rates and the ability to refinance or borrow additional funds can vary substantially depending on a firm's credit rating. The ratings fell substantially during 2015, with a substantial decrease in the profitability of Kansas farms. While 2016, was not as difficult as 2015, the situation further deteriorated. Kansas farmers need to look at adjustments that can be made to restore cash flows to a profitable level over the next couple of years to prevent further erosion in credit quality.

**Figure 1. Probability of Default for Kansas Farms**

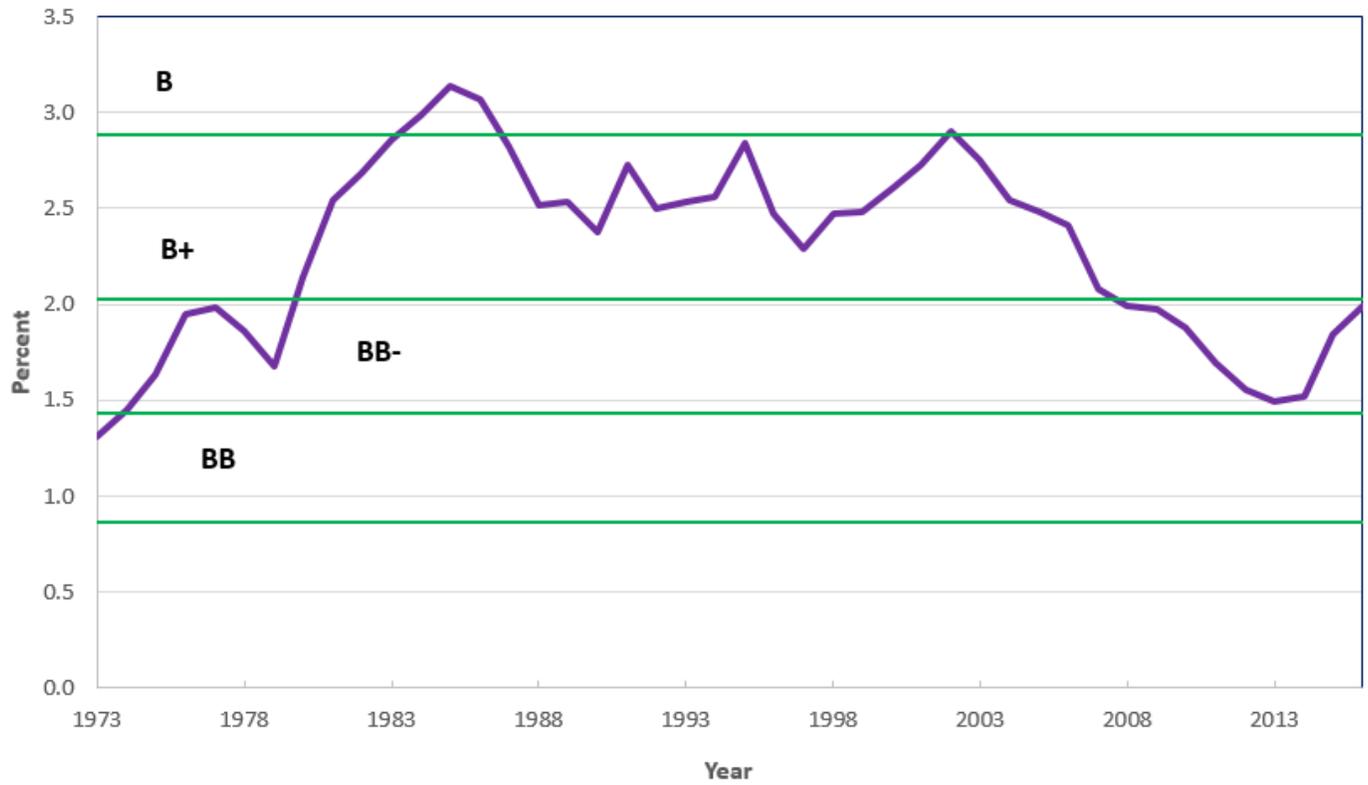
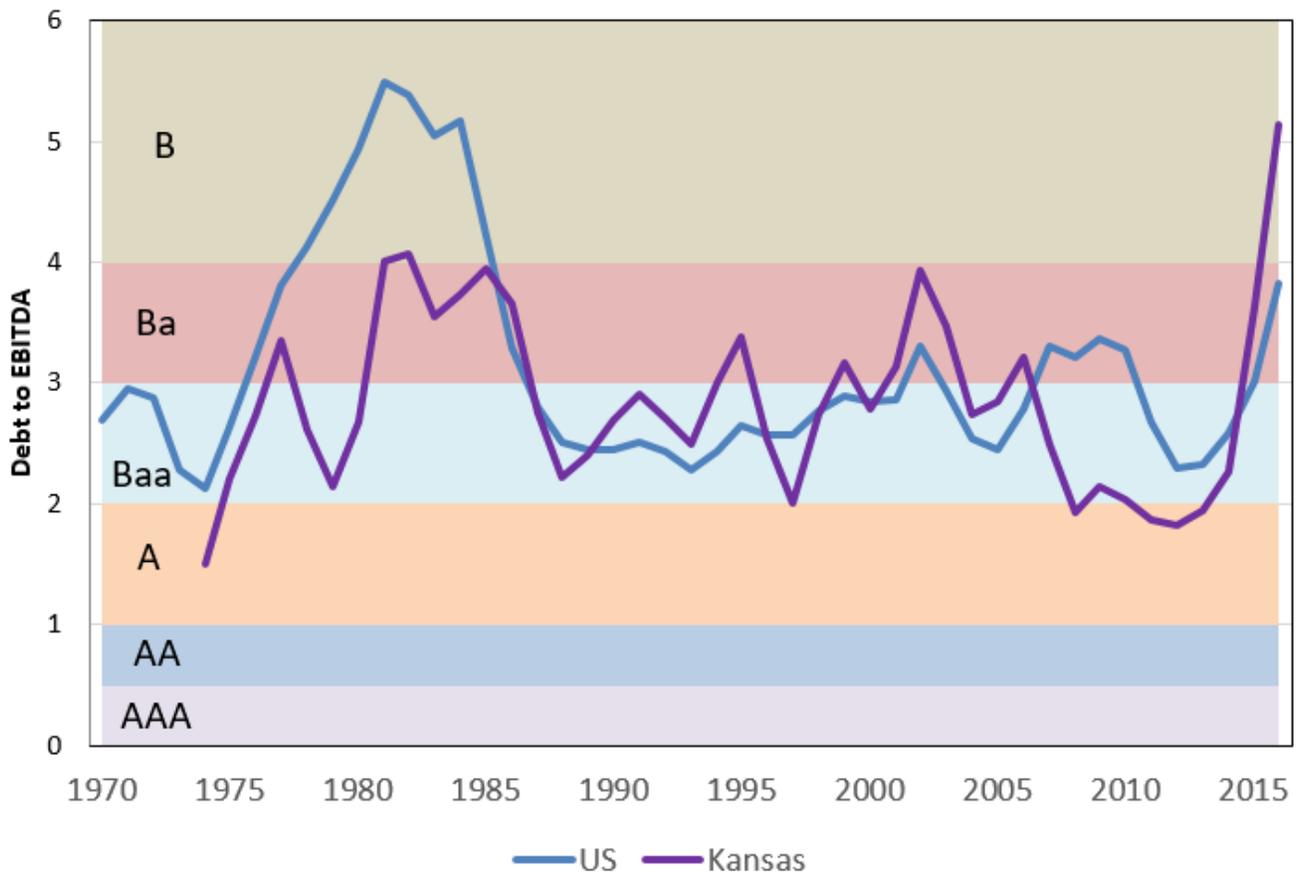


Figure 2. Debt to EBITDA for Kansas Farms



**Table 1. Credit Quality Mappings**

S&P Rating	Probability of Default Range
<b>AAA</b>	(0.00, 0.02]
<b>AA+</b>	(0.02, 0.03]
<b>AA</b>	(0.03, 0.04]
<b>AA-</b>	(0.04, 0.05]
<b>A+</b>	(0.05, 0.07]
<b>A</b>	(0.07, 0.09]
<b>A-</b>	(0.09, 0.14]
<b>BBB+</b>	(0.14, 0.21]
<b>BBB</b>	(0.21, 0.31]
<b>BBB-</b>	(0.31, 0.52]
<b>BB+</b>	(0.52, 0.86]
<b>BB</b>	(0.86, 1.43]
<b>BB-</b>	(1.43, 2.03]
<b>B+</b>	(2.03, 2.88]
<b>B</b>	(2.88, 4.09]
<b>B-</b>	(4.09, 6.94]
<b>CCC+</b>	(6.94, 11.78]
<b>CCC</b>	(11.78, 14.00]
<b>CCC-</b>	(14.00, 16.70]

Source: Lopez, J.A. "The Empirical Relationship between Average Asset Correlation, Firm Probability of Default and Asset Size." Federal Reserve Bank of San Francisco Working Paper, June 2002.

**Table 2. Distribution of Credit Quality for Kansas Farms, 2015 and 2016**

S&P Rating	2015	2016
BBB+	0.12%	0.23%
BBB	0.46%	1.15%
BBB-	6.56%	7.02%
BB+	20.94%	18.99%
BB	26.12%	24.28%
BB-	17.49%	15.88%
B+	13.35%	13.23%
B	6.79%	10.01%
B-	5.64%	5.41%
CCC+	2.53%	3.34%
CCC	0.00%	0.23%
CCC-	0.00%	0.12%
CC	0.00%	0.00%
C	0.00%	0.12%

**Table 3. Rating Matrix for Debt to EBITDA Ratio**

Rating Category	Debt to EBITDA Ratio
AAA	0 to 0.50
AA	0.51 to 1.00
A	1.01 to 2.00
Baa	2.01 to 3.00
Ba	3.01 to 4.00
B	4.01 to 6.00
Caa	6.01 to 8.00
Ca	> 8.00 or < 0

Ellinger, P.N., A.M. Featherstone, and M.D. Boehlje. "Leverage of U.S. Farmers: A Deeper Perspective." Choices, 31(1st Quarter, 2016):1-6, <http://www.choicesmagazine.org/choices-magazine/theme-articles/farm-fiance-theme-are-the-good-times-really-over/leverage-of-us-farmers-a-deeper-perspective>

**Table 4. Probability of Default by Farm Type, 2015 and 2016**

Farm Type	2015	2016
Crop – Non-Irrigated (558 farms)	1.85%	1.97%
Crop – Irrigated (37 farms)	2.13%	2.45%
Crop – Beef (26 farms)	1.74%	1.99%
Crop – Beef Backgrounding (10 farms)	2.77%	2.80%
Crop – Cow Herd (82 farms)	1.63%	1.84%
Cow Herd (22 farms)	2.67%	2.81%
Dairy (17 farms)	1.76%	2.28%
General Farm (12 farms)	1.79%	2.26%

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