Exhibiting Trends in Liquidity for a Sample of Kansas Farms
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Liquidity measures help gauge whether a farm or group of farms has the ability to meet short-term debt obligations. In addition to examining average liquidity values over time, most analysts want to know how many farms fall below specific liquidity thresholds. This article examines differences in liquidity for Kansas Farm Management Association (KFMA) farms with continuous data from 1996 to 2015. Farm types represented in this sample of farms include crop farms, crop/beef farms, and beef farms.

Estimating and Analyzing Liquidity

Commonly used liquidity measures include working capital to gross income, working capital per acre, and the current ratio. Working capital is measured by subtracting current liabilities from current assets. The current ratio is computed by dividing current assets by current liabilities. The working capital to gross income measure can also be computed using gross revenue, value of farm production, or total expenses. Value of farm production is considered a more appropriate measure of gross income when the sample of farms includes both crop and livestock farms. This article uses working capital to value of farm production and the current ratio to measure liquidity.

Liquidity thresholds are typically used by analysts to determine whether a farm has an adequate liquidity position. The two thresholds examined for the working capital to value of farm production were 0.20 and 0.35. The second threshold (0.35) is a commonly used threshold by financial analysts and would be considered an adequate level of working capital to weather a one or two year downturn. The first threshold (i.e., 0.20) depicts a situation where a farm may have trouble repaying loans. As with the working capital to value of farm production threshold of 0.35, a current ratio above 2.0 is considered adequate. A farm with a current ratio below 1.0 is not able to cover their current liabilities by selling all of their current assets, and therefore would have trouble repaying loans.

The characteristics of the KFMA farms with a working capital to value of farm production measure below and above 0.35 are compared. Similarly, farm characteristics for farms with a current ratio below and above 2.0 are compared. T-tests are used to determine whether farm characteristics are significantly different among the liquidity categories for each liquidity measure. A p-value below 0.05 would indicate that the differences in the means between the liquidity categories is significant at the 5% level.

In addition to comparing farm characteristics among the liquidity categories, correlation coefficients between working capital to value of farm production and farm characteristics, and the inverted current ratio and farm characteristics are computed. The inverted current ratio is used rather than the current ratio to avoid dividing by zero (i.e., some of the farms did not have
current liabilities). Significance levels are reported for the correlation coefficients. A p-value below 0.05 would indicate that the correlation coefficient is significant from zero at the 5 percent level.

**KFMA Data**

Figure 1 illustrates the annual averages for working capital to value of farm production for the sample of KFMA farms. Working capital to value of farm production averaged 0.744 over the 20-year period. This liquidity measure was above the average from 2009 to 2015. The 2015 value is interesting. Despite a large drop in net farm income for the sample of farms (dropped from $111,324 in 2014 to $11,149 in 2015), working capital to value of farm production increased in 2015. This increase can be explained by looking at the components of the ratio. Average working capital declined by approximately $27,000. In contrast, average value of farm production dropped by $102,000. Combining these two numbers resulted in a higher average liquidity measure. It is important to point out that the drop in working capital in 2015 was the first decline since 2002.

Trends in the average current ratio for the sample of KFMA farms are depicted in Figure 2. The average current ratio during the 20-year period was 3.55. The current ratio was above the average ratio from 2008 to 2015. The current ratio peaked in 2012 at 5.40, and dropped to 4.08 in 2015. Though relatively lower in 2015 compared to its peak value, the current ratio in 2015 was still higher than the averages experienced prior to 2009.

As noted in the introduction, most analysts are interested in how liquidity measures vary among farms. To examine liquidity differences among farms, we identified the percentage of farms below two thresholds for working capital to value of farm production. The two thresholds examined were 0.20 and 0.35. Figure 3 illustrates the trends in these two thresholds over the 20-year period. On average, over the 20-year period, the percentages of farms with a working capital to value of farm production below 0.20 and 0.35 were 17.1% and 26.8%, respectively. The 2015 percentages are 11.3% for the 0.20 threshold and 17.0% for the 0.35 threshold. The percentage of farms below the 0.20 threshold went up substantially in 2015. However, the 2015 percentage of farms below this threshold is still smaller than what it was prior to 2009.

The two thresholds examined for the current ratio were 1.0 and 2.0. The trends in these two thresholds are illustrated in Figure 4. On average, over the 20-year period, the percentages of farms with a current ratio below 1.0 and 2.0 were 7.6% and 26.9%, respectively. It is important to note that the farms with a current ratio below 1.0 are in a tough spot. To repay debt, these farms would need to increase gross income, reduce expenses, refinance intermediate or long-term debt, or sell intermediate or long-term assets to ensure that the current debt obligations are repaid. The percentage of farms with a ratio below 1.0 (below 2.0) was above average from 1996 to 2005 (1996 to 2007) and below average from 2006 to 2015 (2008 to 2015). The percentage of farms in 2015 with a current ratio below 2.0 (18.6%), though below average, represents a substantial increase from its low of 11.3% in 2012.
Farm Characteristics by Liquidity Categories

Table 1 compares the farm characteristics for farms with a working capital to value of farm production ratio below and above the 0.35 threshold. To create the information in Table 1, 20-year averages for each farm were computed. The farms were then sorted into the two liquidity categories. The measures of liquidity depicted in Table 1 include the current ratio, working capital, working capital to value of farm production, and working capital per acre. As expected, all of these liquidity measures are significantly higher for the farms with a working capital to value of farm production ratio above 0.35. In addition, the farms with the higher liquidity threshold had a higher net farm income, average total assets, and percentage of acres owned; and a lower percentage of labor from crops, debt to asset ratio, and asset turnover ratio. Except for the results with respect to the asset turnover ratio, the differences between the two liquidity categories seem intuitive. The asset turnover ratio differences are puzzling at first glance. The results suggest that the farms with lower levels of liquidity are more fully utilizing their assets. This can be explained by examining differences in average total assets and percentage of acres owned between the two groups. The farms in the higher liquidity category have a larger asset base, due largely to the fact that they own a larger proportion of their land. The asset turnover ratio is computed by dividing value of farm production by average total assets. Value of farm production is similar between the farms in the two liquidity categories. Thus, the relatively larger asset base for the farms in the high liquidity category results in a lower asset turnover ratio for this group of farms.

Comparisons of the farm characteristics for the farms with a current ratio below and above 2.0 can be found in Table 2. To create the information in Table 2, 20-year averages for each farm were computed. The four liquidity measures are substantially higher for the group of farms with an average current ratio above 2.0. Note that the average current ratio for the 20-year period for the group of farms in the low liquidity category was 1.44. The current ratio for this group varied from 0.39 to 1.92. The farms in the higher current ratio category had a higher net farm income and higher labor efficiency (family, operator, and hired labor divided by value of farm production), and a lower debt to asset ratio and asset turnover ratio. The difference in asset turnover ratios between the two current ratio farm categories is relatively smaller than it was between the two working capital to value of farm production categories.

Correlation coefficients between the two liquidity measures and farm characteristics are reported in Table 3 and 4. Before discussing the correlation coefficients, it is important to make two points regarding these coefficients. First, the correlation coefficient between working capital to value of farm production and the inverse current ratio is -0.608. This suggests that the two liquidity measures contain similar information. Note, however, the correlation is not perfect, thus, the two measures do contain at least some unique information. Second, the correlation coefficients between the two liquidity measures and the farm characteristics contain additional information that is not found in Table 1 and 2. Rather than focusing on differences in farm characteristics between specific liquidity categories, the correlation coefficients examine the relationship between each liquidity measure and the full range of values for each farm characteristic.
The results in Table 3 indicate a positive and significant relationship between working capital to value of farm production, and labor efficiency and percentage of acres owned; and negative and significant relationships between working capital to value of farm production, and value of farm production, percentage of labor devoted to crops, debt to asset ratio, and asset turnover ratio. The highest absolute values for the correlation coefficients correspond to the debt to asset ratio, the asset turnover ratio, and crop labor percentage. Farms with more leverage had lower levels of liquidity. Farms that more fully utilized their asset base (i.e., had higher asset turnover ratios) and used more labor for livestock production had lower levels of liquidity.

Table 4 presents the correlation coefficients between the current ratio and each farm characteristic. Compared to the working capital to value of farm production measure, fewer of the farm characteristics were significantly correlated with the current ratio. Labor efficiency was significant and positively related to the current ratio, and the debt to asset ratio and the asset turnover ratio were significant and negatively related to the current ratio. The signs of the correlation coefficients between the current ratio and each of these three variables were the same as the signs for the correlation coefficients between working capital to value of farm production and the three variables.

Summary and Implications

This article examined trends in liquidity for a sample of KFMA farms. Despite a large drop in net farm income in 2015, most farms in the sample still had solid liquidity positions at the end of 2015. Having said that, the percentage of farms below critical liquidity thresholds increased substantially in 2015. These farms may find it difficult to repay loans later this year. Liquidity was positively related to the debt to asset ratio and the asset turnover ratio, and negatively related to percentage of labor devoted to crops.

Liquidity measures in 2016 depend on a multitude of factors including crop prices and yields, weather, and other factors, all of which are inter-related. Using current futures prices adjusted for basis and trend yields; we expect working capital, working capital to value of farm production, the current ratio, and the percentage of farms below critical liquidity thresholds to increase, a further deterioration from 2015. Thus, managing working capital is very important in the current environment.
Figure 1. Working Capital to Value of Farm Production, KFMA Farms.
Figure 2. Current Ratio, KFMA Farms.

- Annual
- Average
Figure 3. Percentage of KFMA Farms Below Working Capital to Value of Farm Production Thresholds.

- Below 0.35
- Below 0.20

Figure 4. Percentage of KFMA Farms Below Current Ratio Thresholds.

Below 2.0

Below 1.0
### Table 1. Characteristics of KFMA Farms by Working Capital to Value of Farm Production Category.

<table>
<thead>
<tr>
<th>Item</th>
<th>Below 0.35</th>
<th>Above 0.35</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Farms</td>
<td>50</td>
<td>197</td>
<td></td>
</tr>
<tr>
<td>Net Farm Income</td>
<td>62,758</td>
<td>90,450</td>
<td>0.003</td>
</tr>
<tr>
<td>Value of Farm Production</td>
<td>374,680</td>
<td>357,169</td>
<td>0.636</td>
</tr>
<tr>
<td>Average Total Assets</td>
<td>1,026,626</td>
<td>1,490,721</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Crop Labor Percentage</td>
<td>88.7%</td>
<td>80.0%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Current Ratio</td>
<td>1.37</td>
<td>4.44</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Working Capital</td>
<td>56,432</td>
<td>322,311</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Working Capital to Value of Farm Production</td>
<td>0.151</td>
<td>0.902</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Working Capital per Acre</td>
<td>29</td>
<td>159</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Debt to Asset Ratio</td>
<td>0.374</td>
<td>0.165</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Operating Profit Margin Ratio</td>
<td>0.096</td>
<td>0.153</td>
<td>0.269</td>
</tr>
<tr>
<td>Asset Turnover Ratio</td>
<td>0.365</td>
<td>0.240</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Return on Investment</td>
<td>0.035</td>
<td>0.037</td>
<td>0.785</td>
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<tr>
<td>Labor Efficiency</td>
<td>0.160</td>
<td>0.171</td>
<td>0.103</td>
</tr>
<tr>
<td>Machinery and Building Investment per Acre</td>
<td>157</td>
<td>153</td>
<td>0.963</td>
</tr>
<tr>
<td>Percentage of Acres Owned</td>
<td>21.4%</td>
<td>31.9%</td>
<td>0.002</td>
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<tr>
<td>Increase in Acres Operated</td>
<td>148</td>
<td>338</td>
<td>0.349</td>
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</table>
Table 2. Characteristics of KFMA Farms by Current Ratio Category.

<table>
<thead>
<tr>
<th>Item</th>
<th>Below 2.00</th>
<th>Above 2.00</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Farms</td>
<td>55</td>
<td>192</td>
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</tr>
<tr>
<td>Net Farm Income</td>
<td>64,553</td>
<td>90,657</td>
<td>0.006</td>
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<tr>
<td>Value of Farm Production</td>
<td>376,549</td>
<td>356,177</td>
<td>0.573</td>
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<tr>
<td>Average Total Assets</td>
<td>1,356,204</td>
<td>1,408,397</td>
<td>0.500</td>
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<tr>
<td>Crop Labor Percentage</td>
<td>81.9%</td>
<td>81.8%</td>
<td>0.966</td>
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<tr>
<td>Current Ratio</td>
<td>1.44</td>
<td>5.64</td>
<td>&lt; 0.001</td>
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<td>Working Capital</td>
<td>103,742</td>
<td>315,683</td>
<td>&lt; 0.001</td>
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<tr>
<td>Working Capital to Value of Farm Production</td>
<td>0.276</td>
<td>0.886</td>
<td>&lt; 0.001</td>
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<tr>
<td>Working Capital per Acre</td>
<td>51</td>
<td>156</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Debt to Asset Ratio</td>
<td>0.353</td>
<td>0.152</td>
<td>&lt; 0.001</td>
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<tr>
<td>Operating Profit Margin Ratio</td>
<td>0.108</td>
<td>0.150</td>
<td>0.797</td>
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<td>Asset Turnover Ratio</td>
<td>0.278</td>
<td>0.253</td>
<td>0.006</td>
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<td>Return on Investment</td>
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<td>0.038</td>
<td>0.958</td>
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<td>Labor Efficiency</td>
<td>0.161</td>
<td>0.171</td>
<td>0.014</td>
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<tr>
<td>Machinery and Building Investment per Acre</td>
<td>155</td>
<td>154</td>
<td>0.955</td>
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<tr>
<td>Percentage of Acres Owned</td>
<td>27.3%</td>
<td>30.5%</td>
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<td>Increase in Acres Operated</td>
<td>42</td>
<td>373</td>
<td>0.096</td>
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<td>Item</td>
<td>r</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Value of Farm Production</td>
<td>-0.184</td>
<td>0.004</td>
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<tr>
<td>Average Total Assets</td>
<td>0.077</td>
<td>0.229</td>
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<tr>
<td>Crop Labor Percentage</td>
<td>-0.305</td>
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<tr>
<td>Debt to Asset Ratio</td>
<td>-0.584</td>
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<td>Operating Profit Margin Ratio</td>
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<tr>
<td>Return on Investment</td>
<td>-0.104</td>
<td>0.103</td>
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<tr>
<td>Labor Efficiency</td>
<td>0.240</td>
<td>&lt; 0.001</td>
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<tr>
<td>Machinery and Building Investment per Acre</td>
<td>-0.113</td>
<td>0.076</td>
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<tr>
<td>Percentage of Acres Owned</td>
<td>0.221</td>
<td>&lt; 0.001</td>
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<tr>
<td>Increase in Acres Operated</td>
<td>0.016</td>
<td>0.804</td>
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Table 4. Correlation Coefficients between Inverted Current Ratio and Farm Characteristics.

<table>
<thead>
<tr>
<th>Item</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Farm Production</td>
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<td>0.304</td>
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<td>Crop Labor Percentage</td>
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<tr>
<td>Debt to Asset Ratio</td>
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<td>Operating Profit Margin Ratio</td>
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<td>Asset Turnover Ratio</td>
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