3-25-2019

Impact of Selected Financial Measures on the Term Debt Repayment Ability of Illinois Grain Farms

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IMPACT OF SELECTED FINANCIAL MEASURES ON THE TERM DEBT REPAYMENT ABILITY OF ILLINOIS GRAIN FARMS

SAMUEL AWORTWE JOHNSON

45 pages

A clear and accurate assessment of the financial performance of a farm business is an important component of financial management at any time but becomes even more crucial in periods of economic downturn in the farm sector. Farmers continue to increase their debt even though the prices of commodities are low, and the prices of inputs are high (Krapf, Raab, & Zwilling, 2017). In addition, high family living expenses can also place financial pressure on farms (Scott, 2016). This study focused on identifying and estimating the impact of key factors which included financial measures and family living expenses on the term debt repayment ability of Illinois grain farms. A data set was obtained from the 2017 final financial statements of grain farms that utilized financial services of the Illinois Farm Business Farm Management Association. A binary logistic regression model was used to estimate the impact of selected financial measures and family living expenses on the term debt coverage ratio, which was used to measure the term debt repayment ability of grain farms in Illinois. The results showed that return on farm assets and acres operated positively affected the ability of a grain farm to service term debt whereas debt to asset, asset turnover, farm operator's age and family living expenses negatively affected the ability of a grain farm to service term debt.

KEYWORDS: debt, family living expenses, financial ratios, grain farms, Illinois Farm Business Farm Management Association, net farm income, term debt repayment ability

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A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

Department of Agriculture

ILLINOIS STATE UNIVERSITY

2019

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ACKNOWLEDGMENTS

First, I would want to show appreciation to my advisor, Dr. Iuliia Tetteh of the Department of Agriculture at Illinois State University. She was a great source of inspiration and motivation. Her door was always open to me for questions and suggestions as I undertook this informing research. Most importantly, her experience in this research area helped direct me in the right way and I am grateful to have worked with such a resourceful person.

Also, I would like to extend my sincere gratitude to Dr. Kerry Tudor (Department of Agriculture, Illinois State University), Dr. Michael Barrowclough (Department of Agriculture, Illinois State University) and Dr. Marina Ptukhina (Department of Mathematics and Statistics, Whitman College). Their knowledge in conducting research were extremely helpful and key to my research study. Every one of them showed concern over my progress and dedicated time to assist me whenever I seek for their assistance.

And to Illinois Farm Business Farm Management Association, I appreciate the association for giving me access to such an exclusive data set for this study. Not forgetting the faculty and staff members of Department of Agriculture, my office mates and class mates, every one of them was helpful in my studies and research during my education at Illinois State University.

Finally, I am grateful for my parents and my fiancée, Miss Fanta B. Maiga for their support throughout my two-year graduate education and the process of researching and writing this thesis. This achievement became a reality and was possible with them by my side.

S.A.J.

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CHAPTER I: INTRODUCTION

Farm Debt

Due to the capital intensive nature of the U.S. farm sector, the growing size of farm operations and increases in the prices of non-current assets used in agricultural production, debt financing continues to play a vital role in the U.S. farm sector (Dumas, 2018). When choosing debt financing, producers need to consider three main factors that have significant impacts on the farm's financial position: the amount of debt, interest rate and income available to the farm business to service its debt (Storey, 2017). A careful consideration of these factors helps determine whether undertaking additional debt will place additional financial stress on the operation or create a financial cushion that will enhance the farm's ability to service debt. Lower interest rates and higher income levels typically improve a farm's debt repayment ability, while higher interest rates and lower income levels weaken a farm's debt repayment ability (Briggeman, 2010).

Over the last 17 years, U.S. farm debt, including both real and non real estate debt, has risen by 72 percent despite low commodity prices, declines in farm incomes, and increases in interest rates (USDA, 2019). This recent history shows that, farm operations continue increaing the use of debt financing even in times of farm financial stress (Briggeman, 2010). According to Briggeman (2010), farm debt (in real terms) has risen nearly 5 percent annually since 2004. A 2018 report from the United States Department of Agriculture (USDA) revealed that, farm real estate debt which accounts for 61 percent of total debt, was expected to reach $250.9 billion, a 5.4 percent annual increase in nominal terms and 3.0 percent increase in inflation-adjusted dollars. Furthermore, farm nonreal estate debt was expected to rise to $158.6 billion, an increase of 2.3 percent in nominal terms (USDA, 2018). More debt in a farm's capital structure result in

higher leverage as the debt amount used to finance farm assets increases relative to the equity. As a result, debt to asset ratio tends to move upward while equity to asset ratio declines. According to the USDA, 2018 solvency measures will be at their weakest level since 2009.

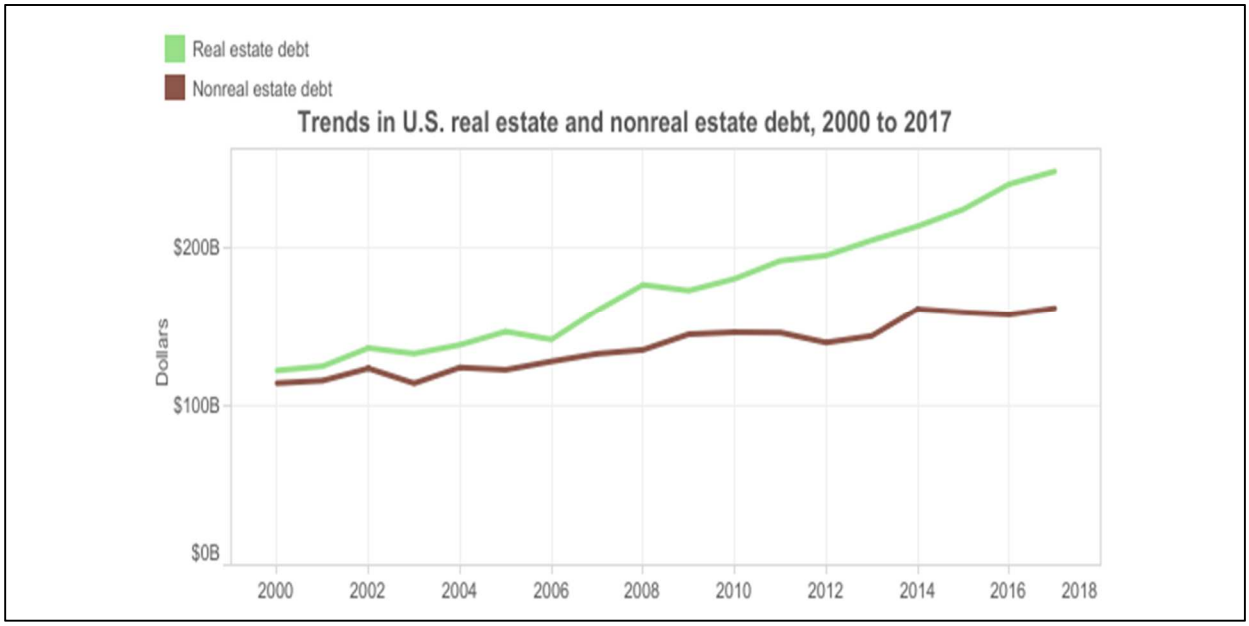

Figure 1: U.S. Real Estate and Non Real Estate Debt, 2000 to 2018 (Real Terms)

Source: USDA, Economics Research Service, March 06, 2019

Farm Debt Interest Rates

Farm loan interest rates represent fees charged by the lender to the borrower against loan principal. The interest rate assigned to a farm loan is influenced by the risk profile of the borrower (Mortgage.info, 2018). Interest rates on farm loans used to finance operating expenses have increased significantly. The interest rate of 3.5 percent in the fourth quarter of 2015 increased to 4.9 percent in the first quarter of 2018 (Federal Reserve Bank of Kansas City, 2018). The Federal Reserve district surveys of agricultural banks of varying sizes reported that, there had been a 25 basis points increase in interest rates on farm real estate loans between the fourth quarter of 2016 and the fourth quarter of 2017. Eventhough the increase has been steady, any additional increase is projected to put downward presssure on farmland values in the nation.

Grain Prices

In 2017, incomes for grain farms were projected to be lower than 2016 due to lower corn and soybean prices (Schnitkey, 2017). The average price of corn, which was 5.69 dollars per bushel in 2013, declined to 3.62 dollars per bushel in 2017 (Macrotrends, 2018), which represented a 36.4 percent decrease in the prices of corn over five years. Also, there has been a 29.4 percent decrease in soybean prices over the same period as the price of soybean declined from 13.86 dollars per bushel in 2013 to 9.78 dollars per bushel in 2017 (Macrotrends, 2018). With concerns being raised over further price decline in grains and declines in farm income, lenders seek to know the financial health and performance of grains farms (American Bankers Association, 2017). A survey conducted in the Midwestern U.S. showed that, declines in farm income had resulted in 51 percent of lenders restructuring their farm loans in 2016 (Creighton University, 2017).

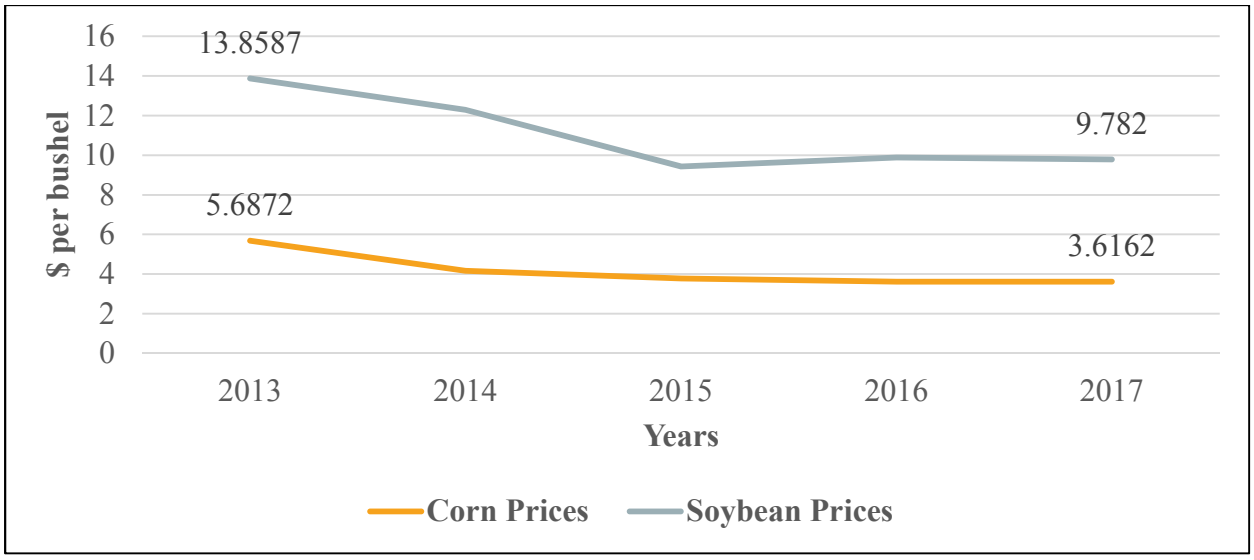

Figure 2: Prices of Corn and Soybean in 2013 and 2017

Source: https://www.macrotrends.net/2532/corn-prices-historical-chart-data

Delinquency and Default Rates

There have also been significant changes in default and delinquency rates. In the U.S., lenders typically report a loan delinquent after two consecutive missed payments by an individual or a firm. If there are missed consecutive payments by an individual or a firm that exceed 270 days, there is a declaration of loan default under the Code of Federal Regulations.

In the Midwestern U.S., lenders reported a 2.1 percent increase in farm loan defaults between 2016 and 2017 (Creighton University, 2017). Delinquency rates of agricultural loans in the U.S. increased by an average of 67 percent from the first quarter of 2016 to the last quarter of 2018 (Board of Governors of the Fedral Reserve System, 2017). It is therefore critical to examine the key financial measures and debt repayment ability of Illinois grain farms in a time when default rates and delinquency rates are increasing steadily.

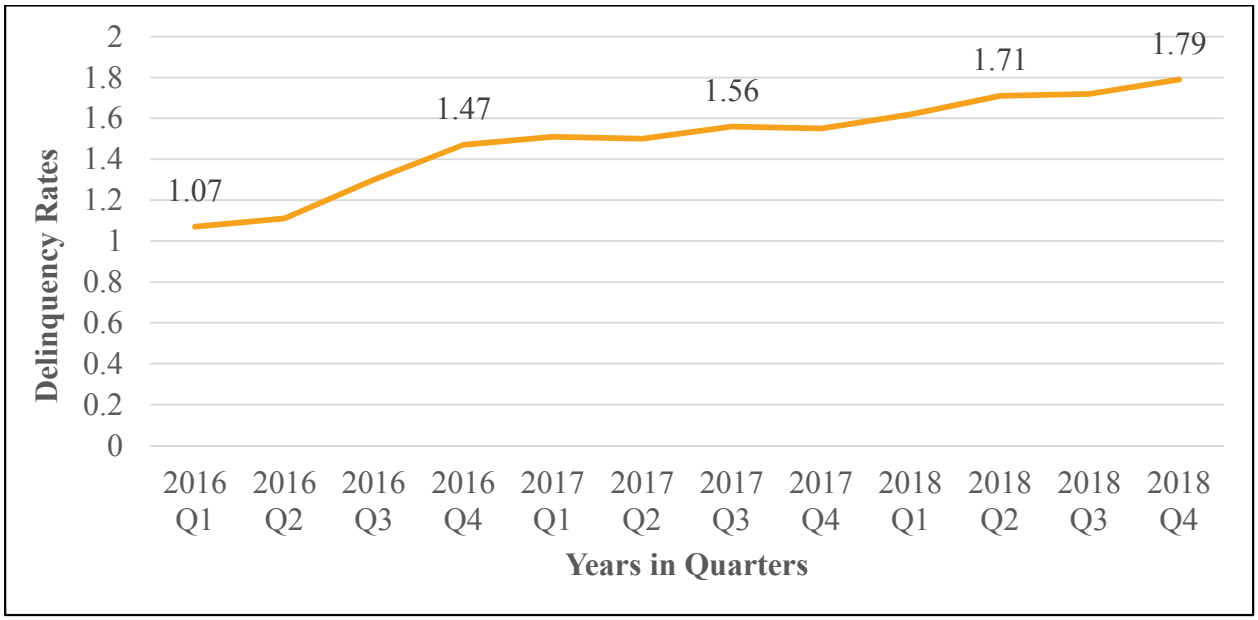

Figure 3: Delinquency Rates of Agricultural Loans from the First Quarter of 2016 to the Fourth Quarter of 2018

Source: Board of Governors of the Federal Reserve System, 2018

Problem Statement

U.S. agricultural debt continues to increase which posing challenges to the financial health of farms in periods of continued downturn in the farm sector (Krapf, Raab, and Zwilling, 2017). Farmers continue undertaking debt despite continued decline in farm incomes and deterioration of term debt repayment ability, which may be attributed to low commodity prices (Krapf et al, 2017).

Existing studies have identified and assessed the relationship among financial measures, such as profitability, solvency, liquidity and efficiency ratios and the debt repayment ability of farms (Zech and Pederson, 2003; Durguner and Katchova, 2007; Quaye and Hartarska, 2015). According to Durguner and Katchova (2007), return on farm assets (a measure of profitability) is one of the major factors determining the debt repayment ability of farms. Durguner and Katchova further identified working capital to gross farm return as a liquidity measure with a significant impact on the debt repayment ability of farms. The debt to asset ratio is a measure of solvency that has been identified as another important predictor of a farm's debt repayment ability (Durguner and Katchova, 2007; Zech and Pederson, 2003). In addition, a study by Zech and Pederson (2003) identified family living expenses as a key factor that affects cash flows and the ability of farms to service debt. Most recent studies have not investigated the impact of family living expenses on the debt repayment ability of farms even though this factor allegedly affects farm cash flows and a farmer's ability to repay debts (Scott, 2016).

A 2017 report from USDA predicted that debt to asset ratio and debt to equity ratio would continue to increase. Relatively, low net farm incomes and the declines in land values have generally been associated with increases in total farm debt and decreases in total farm assets which have resulted in an increase in debt to asset ratio (Langemeier, 2017). Current ratio,

a measure of liquidity, was expected to further decline to 1.67 in 2017 following an average of 2.26 over the previous nine years (USDA, 2017). This means farms initially had two dollars and twenty-six cents of current assets at their disposal to pay off one dollar of current debt, but they were projected to have only one dollar and sixty-seven cents of their current assets to pay off a dollar of their current debt. Those figures reveal a weakening in the liquidity of farms, which affects the debt repayment ability of farms.

Those financial measures indicate ongoing deterioration of U.S. farms' profitability and liquidity, imposing potential threats to the farm's ability to service debt. In Illinois, 2017 net incomes of grain farms were down from 2016 levels due to lower yields. Net income is expected to decline further if there are no positive changes to grain prices in subsequent years (Schnitkey, 2017).

Purpose Statement

The purpose of this study was to identify and assess the impacts of selected financial measures including profitability, liquidity, solvency and efficiency ratios, as well as family living expenses of Illinois grain farms[1] on their ability to service term debt. The term debt coverage ratio was used as a proxy for the term debt repayment ability of grain farms. The results will enable farmers and lenders identify significant financial measures affecting the term debt repayment ability of Illinois grain farms and provide information on their term debt repayment ability.

[1]Illinois grain farms are represented by grain farms that utilize financial services from Illinois Farm Business Farm Management Association.

Research Objectives

1. Estimate the impact of selected financial measures on the term debt repayment ability of Illinois grain farms as measured by the term debt coverage ratio.
2. Shed light on the importance of family living expenses to the term debt repayment ability of Illinois grain farms.
3. Determine whether the factors affecting the term debt repayment ability of Illinois grain farms vary across the sizes of operation.

CHAPTER II: LITERATURE REVIEW

Farm Debt Repayment Ability

When initiating a new loan, farm businesses are required to demonstrate that they can generate enough cash flow to cover input costs, pay income taxes, meet debt obligations and family living needs (Lattz, 2017). Debt repayment ability is commonly used to evaluate the ability of a farm business to generate enough cash throughout the year to cover scheduled loan payments (White, 2008). Following the trend of lower level of farm income, debt repayment ability has also worsened as the demand for farm loans remain high and credit conditions deteriorate (Kauffman and Kreitman, 2018). Default rates and loan delinquency rates still remain low but are increasing steadily every year which also indicate a deterioration of the farm's ability to service debt. The agricultural lender survey in the Midwestern U.S. conducted by Creighton University (2017) shows that lenders observed an increase in restructuring farm loans (51 percent of surveyed lenders) and started tightening collateral requirements (18.6 percent of lenders). According to Kauffman and Kreitman (2018), bankers in Nebraska and the Mountain States have been experiencing more than 35 percent repayment problems in their farm loan portfolio.

In order to clearly understand a farm's ability to service debt, lenders and researchers have adopted various repayment ratios for the purpose of assessing farms prior to giving them access to loans. Recent studies used coverage ratio or term debt coverage ratio, a measure of the debt repayment ability of farm, to assess the ability of farms to service debt (Durguner and Katchova, 2007; Zech and Pederson, 2003). Coverage ratio measures the ability of the borrower to repay loans with existing cash flows (Lattz, 2017).

Farm Income and Commodity Prices

The price of farm commodities is a significant driver of farm income generated by farms across the country. Continuous decline in commodity prices becomes a concern as it affects the farm's profitability, liquidity and ability to service term debt and future growth (Kauffman and Kreitman, 2018). In 2017, the Illinois Farm Business Farm Management Association (FBFM) recorded an average net income of $46,000 per grain farm compared to $75,000 in 2013. Lower corn price was identified as a major cause for this decline since there was a slow patronage of corn for producing ethanol as well as high yields of corn produced across different parts of the world (Schnitkey, 2019). Using trend yields developed by Schnitkey, projections show that the average Illinois grain farm will face a loss of $55,000 in 2019, which will deteriorate working capital and the financial performance and position of farms. Schnitey (2019) further suggested that farm income will decline due to two main factors. Rising production (non-land) costs for corn and soybeans (particularly, fertilizer cost) will increase expenses and reduce farm income. The second factor is lower soybean prices. With the current yields expectations in U.S. and South America, Schnitey (2019) suggests the prices of soybean may fall below $9 per bushel in 2019.

Other Factors Influencing the Debt Repayment Ability of Farms

Agricultural lenders are generally concerned about commodity prices, farm income and liquidity since these factors impact the debt repayment ability of their clients. According to the 2017 survey conducted jointly by the American Bankers Association and the Federal Agricultural Mortgage Corporation, nearly 90 percent of agricultural lenders observed an overall decline in farm profitability within a period of twelve months. The survey identified commodity price volatility as the top concern for farm profitability, and approximately 80 percent of

agricultural lenders showed much concern for the decline in grain prices. Lenders also reported that a majority of their current agricultural clients (60 percent) across all farms were profitable in 2016 but expected fewer number of their borrowers (54 percent) to remain profitable in the year, 2017.

Multiple approaches are used to evaluate a farm's financial condition, which provide stakeholders insights into the financial performance of farms (Hoppe, 2014). Financial ratio analysis in particular helps evaluate the profitability, liquidity, financial efficiency, solvency and debt repayment ability of farms (Hoppe, 2014). The American Bankers Association established Farm Financial Standard Taskforce, now known as Farm Financial Standard Council (FFSC), to make recommendations on financial reporting and analysis in the farm sector (FFSC, 2011). The council have made recommendations on the terminology, ratio computation and interpretation for financial analysis of farms in the country (FFSC, 2011). The FFSC has grouped these financial ratios into five broad categories, including profitability, liquidity, solvency, financial efficiency and repayment capacity. Reichert and Posey (2011) found that these financial ratios have significant effect on the debt repayment ability of farms. Other research studies have also employed these same financial ratios as factors to examine the debt repayment ability of farms (Zech & Pederson, 2003; Durguner & Katchova, 2007; Quaye & Hartarska, 2015).

The next discussion focuses on each group of the ratios separately and provides current statistical evidence of the U.S. farm sector's performance in each of the areas of the financial ratios.

Profitability ratios measure the extent to which a business generates a profit from the use of land, labor, management, and capital (FFSC, 2011). The FFSC recommends five profitability ratios: rate of return on farm assets, rate of return on farm equity, operating profit margin ratio,

net farm income and earnings before interest, tax, depreciation and amortization. According to Durguner and Katchova (2007), rate of return on farm assets is a major factor determining the debt repayment ability of farms. The FFSC also regards the rate of return on the farm assets as an overall index of profitability. This ratio shows the return generated per $1 of assets, and a greater ratio suggests a higher profitability of the operation.

Figure 4: Profitability Ratios of U.S. Farms, 2008 to 2018

Source: USDA, Economics Research Service, August 30, 2018

According to FFSC, liquidity describes the ability of a farm business to meet financial obligations which are due during the ordinary course of the business, typically within the next 12 months. The liquidity ratios include current ratio, quick ratio, working capital and working capital to gross revenue ratio. Durguner and Katchova (2007) identified working capital to gross farm return as a liquidity measure with a significant effect on the debt repayment ability of farms. This ratio gives a relationship between working capital and the size of the farm business

(FFSC, 2011). The higher the value, the greater is the liquidity of the farm business. This means a higher value indicates that a farm business has a greater ability to meet its financial obligations as they come due in the ordinary course of the farm operations.

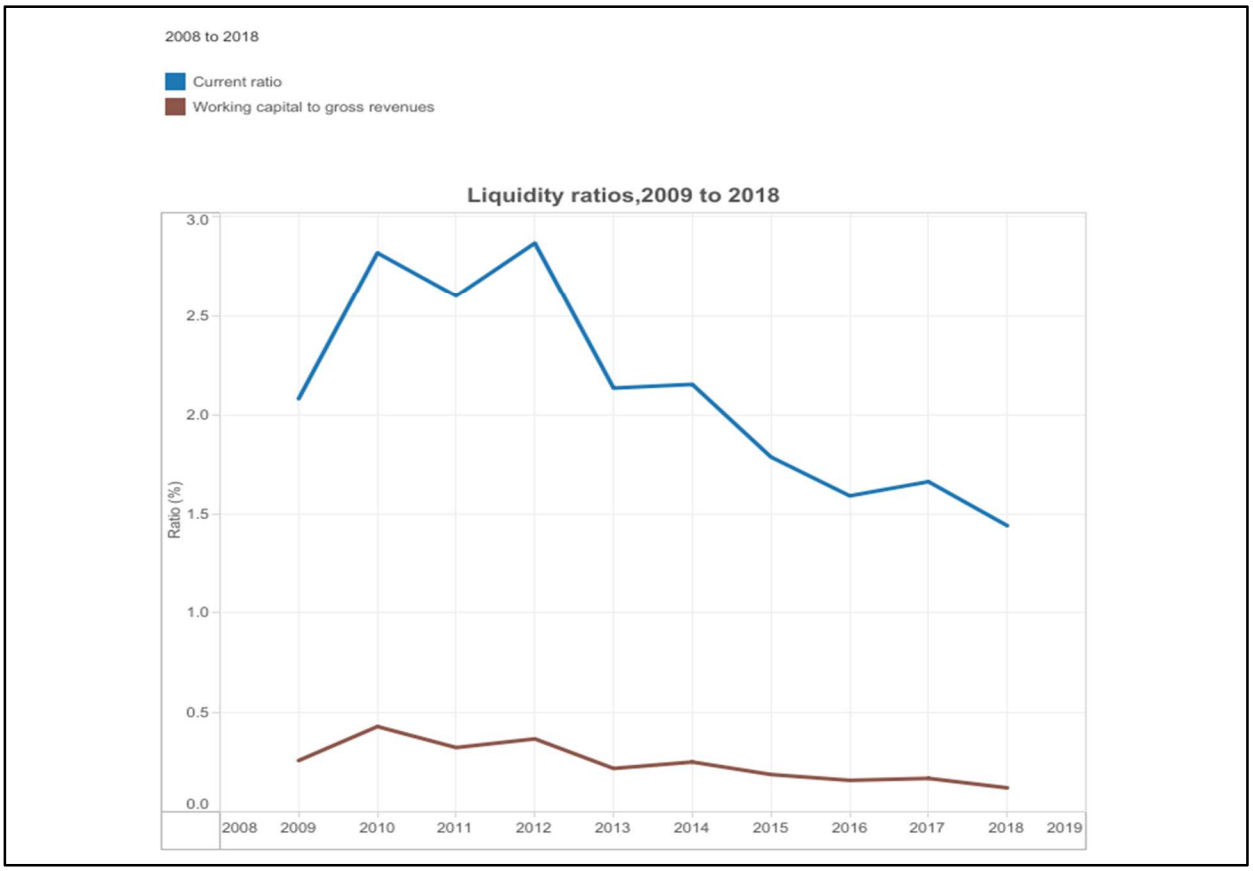

Figure 5: Liquidity Ratios of U.S. Farms, 2009 to 2018

Source: USDA, Economics Research Service, August 30, 2018

Solvency measures the amount of borrowed capital (or debt), leasing commitments, and other expense obligations used by a farm business relative to the amount of owner equity invested in the farm business (FFSC, 2011). Solvency ratios include debt to asset ratio, equity to asset ratio and debt to equity ratio. Debt to asset ratio, which measures the total obligations owed to others as a percent of all assets, has been identified as an important predictor of farm's debt repayment ability (Durguner and Katchova, 2007; Zech and Pederson, 2003). Debt to asset ratio

also expresses the farm's risk exposure because the ratio shows lenders' claims against the assets of the farm business. Therefore, the higher the ratio, the greater is the risk which the farm business is exposed to.

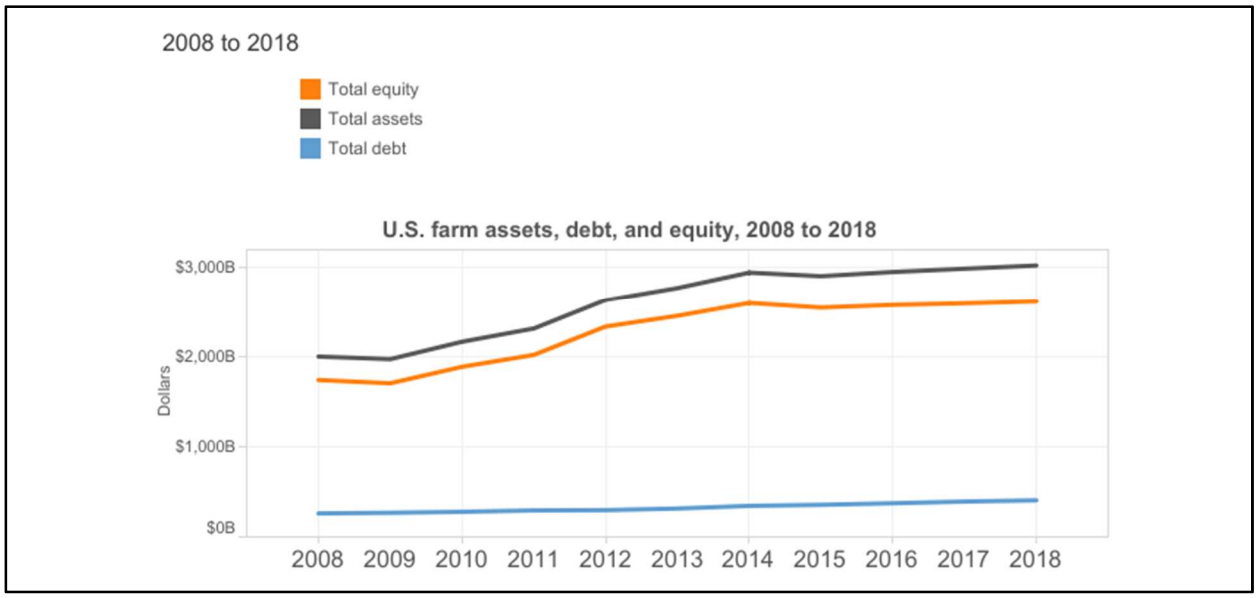

Figure 6: U.S. Farm Assets, Debt, and Equity, 2008 to 2018

Source: USDA, Economics Research Service, August 30, 2018

Financial efficiency is the area of the financial analysis which shows how effectively the farm utilizes its assets and makes production, purchasing, pricing, financing, and marketing decisions (FFSC, 2011). Financial efficiency ratios consist of asset turnover ratio, operating expense ratio, depreciation or amortization expense ratio, interest expense ratio and net farm income from operations ratio. Recent studies found that, asset turnover ratio has a significant effect on the debt repayment ability of farms (Zech and Pederson, 2003; Quaye and Hartarska, 2015). The higher the ratio, the more efficiently the farm assets are used to generate revenue.

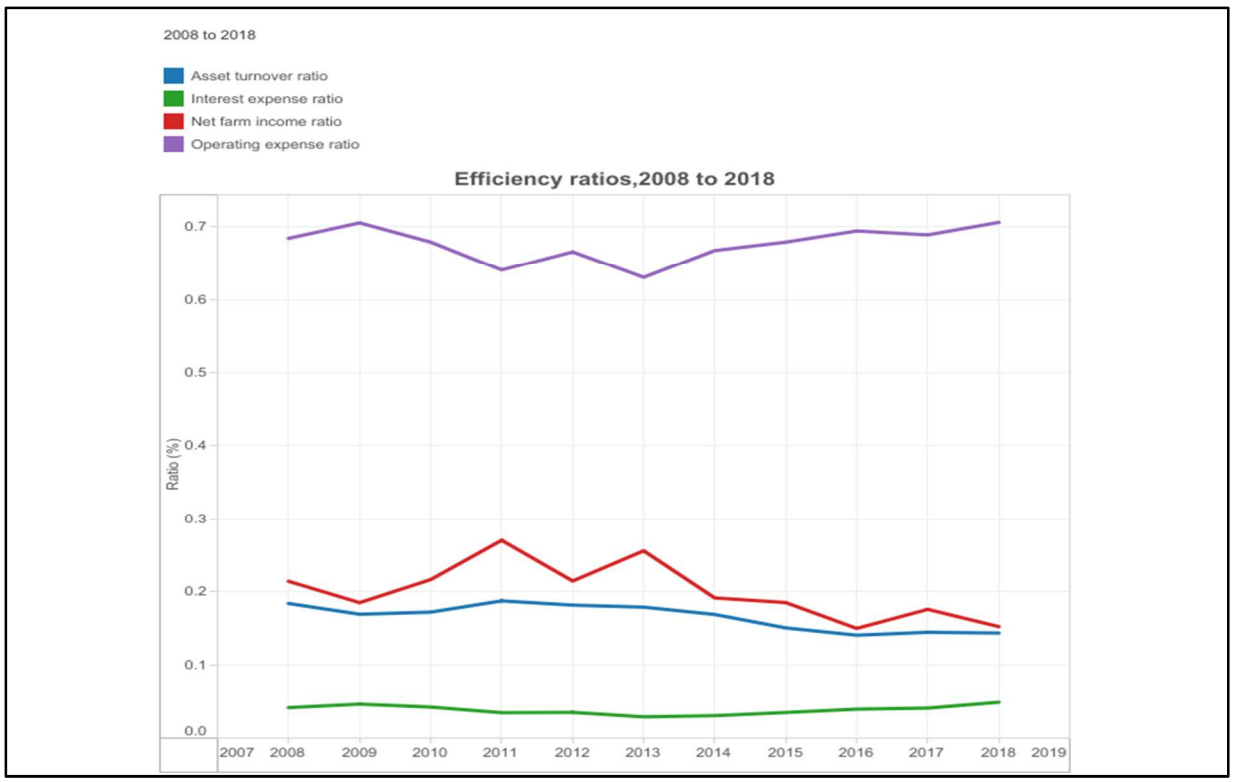

Figure 7: Efficiency Ratios of U.S. Farms, 2008 to 2018

Source: USDA, Economics Research Service, August 30, 2018

Repayment capacity is another area of financial analysis which focuses on understanding whether the business has sufficient cash to make scheduled principal and interest payments. It shows the ability of a borrower to repay term farm debt from farm and non-farm income (FFSC, 2011). Repayment capacity measures such as capital debt repayment capacity, capital debt repayment margin, replacement margin, term debt and capital lease coverage ratio, and replacement margin coverage ratio are mainly used as either proxies for debt repayment ability and capacity of a farm business or factors affecting the creditworthiness of farms. Several research studies (Zech and Pederson, 2003; Durguner and Katchova, 2007) used coverage ratio[2] as a measure of farm's debt repayment ability. A study by Reichert and Posey (2011) however

[2] In this context, coverage ratio is equivalent to term debt and capital lease coverage ratio.

identified the coverage ratio as a significant factor explaining loan deliquency rates. In interpreting the results for repayment capacity measures, the higher the measure, the greater is the farm's capacity or margin to cover payments of principal and interest payment on debt and capital leases.

Farm Family Living Expenses and Equity Withdrawals

Family living expenses is a common term used to represent non-business owner withdrawals from the farm although they are not the same (Eggers, 2017). Nonetheless, owner withdrawals can be calculated using the total family expenses in the absence of recordkeeping system (Eggers, 2017). Family living expenses have a direct impact on farm cash flows and thus need to be controlled to ensure adequate ability to service debt (Scott, 2016). According to McDonald and Marshall (2017), farm businesses reduce their business contribution to household in response to business cash-flow problems but there are no changes in the business contribution to household in response to household cash-flow problems. This shows how important it is to reduce withdrawals from a business especially in periods of cash-flow problems in order to maintain the financial cushion in the business and prevent further deterioration of its liquidity and debt repayment ability.

Annual family living expenses represent a measure of equity withdrawals from the farm each year and traditionally include contributions, medical expenses, life insurance premiums, family living-expendables and family living-capital (Biros et al., 2018). Family living-expendables has been identified as the highest category of family living expenses (70%) as most farm families in Illinois spend more income on food, utilities, household supplies and other basic necessities (Biros et al., 2018). It is generally assumed that farm operators or owners and their family depend primarily on the farm business to cover their household living expenses unless

adequate information about the off-farm income is available. Nonetheless, some farms are likely to have cash flow from other non-farm businesses to cover these expenses.

Financial analysts and counselors are therefore advised to critically examine family owned businesses because these entities are affected not only by the business system but also by the household system and the intermingling resources used among these two systems (Zuiker, et al., 2002). However, it is important that, financial analysts do not assume business activities are the sole contributor to cash flow problems in family owned businesses.

CHAPTER III: METHODOLOGY

Data

Non-probability convenience sampling was used to obtain secondary data from 1,566 Illinois grain farms from Illinois Farm Business Farm Management Association (FBFM). Financial data gathered from the 2017 financial statements of FBFM grain farms[3] was used to compute selected financial ratios[4] recommended by the FFSC and compile information about family living expenses. The FBFM data base also provided information about acres operated, ages of farm operators, and household size for each farm operation.

Values from balance sheets and income statements were used to compute financial ratios such as working capital to gross revenue, return on farm assets, debt to asset, and asset turnover for each farm operation. Information from the statement of sources and uses of funds was used to compute the term debt coverage ratio and identify family related cash flows. Family related cash flows (family living expenses), as employed in this study, were expected to have an impact on the term debt repayment ability of FBFM grain farms because of their relationship to and effect on farm business cash flows (McDonald and Marshall, 2017).

Empirical Specification

A binary logistic regression model was used to estimate the impact of financial measures and family living expenses on the term debt repayment ability of FBFM grain farms. Following Zech and Pederson (2003), and Durguner and Katchova (2007), a binary logistic regression model is an appropriate model for estimating the farm's term debt repayment ability as reflected by term

[3] Farm observations analyzed in this study will be referred to as FBFM grain farms.
[4] Selected financial ratios were generally selected following the recommendations by FFSC but due to limited availability of financial data, the computations of these selected financial ratios are slightly different from the FFSC financial ratios computation. See Table 1 for the description of the selected financial ratios for this study.

debt coverage ratio[5]. Values for the term debt coverage ratio were used to create a binary variable where values greater than or equal to 1 represented "sufficient" ability to service term debt (coded as 1), and values less than 1 represented "insufficient" ability to service term debt (coded as 0). The selected financial ratios, family living expenses and other control variables that were utilized as independent variables were measured as continuous variables.

The statistical model is specified as shown below:

$$log\left(\frac{\pi}{1-\pi}\right)=\beta_0 + \beta_1 ROA + \beta_2 WCGR + \beta_3 DA + \beta_4 ATR+\beta_5 FLE + \beta_6 ACR + \beta_7 AGE + \beta_8 SIZE$$

π=P(Y=1), where Y= Term debt coverage ratio

ROA, Return on farm assets ratio

WCGR, Working capital to gross revenue ratio

DA, Debt to asset ratio

ATR, Asset turnover ratio

FLE, Family living expenses

ACR, Acres operated

AGE, Farm operator's age

SIZE, Household size

[5] Term debt coverage ratio is similar to term debt and capital lease ratio recommended by FFSC. Term debt coverage ratio measures the ability of the borrower to cover all term debt payments before acquisition of unfunded assets.
Term debt coverage ratio = (Net income + non-farm income + interest + depreciation - family living expenses - income taxes) / (principal + interest payments).

Description of Variables

Table 1 shows the independent and dependent variables included in the study, their abbreviation as used in the model and the expected sign based on previous studies.

Table 1

Description of Variables and Expected Signs

Variables	Description of Variables	Expected Signs
FINACIAL RATIOS:		
WCGR	Current assets-current liabilities/gross revenue	+
ROA	Net income/total farm assets	+
DA	Debt/total farm assets	-
ATR	Total revenue/total farm assets	+
FLE	Contributions plus medicals plus life insurance premiums plus expendables plus capital expense	-
CONTROL VARIABLES:		
ACR	Acres operated	-
AGE	Farm operator's age	-
SIZE	Household size	-

U.S. Farm Typology

For the purposes of understanding the farm economic well-being and their implications on farm policy, farms have been categorized into multiple classes (Hoppe, 2014). The USDA recommends using gross cash farm income[6] (GCFI) as a measure of the size of a farm business since it captures the total revenue received by the firm. This measure generally includes farm operator's sales of crops and livestock, fees for delivering commodities under production contracts, government payments and farm-related income (NASS, 2017).

[6] Gross cash farm income (cash basis) is a term similar to gross farm returns (accrual basis)

According to this typology, farms with gross cash farm income less than $350,000 are classified as small family farms. Farms with gross cash farm income from $350,000 to $999,999 are referred to as midsize family farms whilst family farms with gross cash farm income of $1,000,000 or more are referred as large family farms (NASS, 2017). FBFM grain farms were therefore grouped using this typology to fully understand how key drivers affect the term debt repayment ability of these different farm groups; small FBFM grain farms, midsize FBFM grain farms and large FBFM grain farms.

Limitation of the Study

A limitation of this study was the inability to determine sources of funds used for family living expenses. Some farms will have one or more family members who are employed off the farm. Farm businesses with off-farm employment may have less withdrawals from the farm to cater for family living expenses. In this case, family living expenses may not have a severe impact on the farm's cash flow since their off-farm income may be used to cover family living expenses. The use of family living expenses as a measure of farm withdrawals however may not be accurate, but most lenders and advisors use it because of the absence of farm recordkeeping system on withdrawals (Eggers, 2017).

CHAPTER IV: RESULTS AND DISCUSSION

This section provides the results of the data analysis and discusses their implications. Descriptive statistics have been provided for farm demographics and other selected farm measures. Estimated parameters, levels of significance and odds ratios have been tabulated for the binary logistic regression model, which was estimated for multiple groups: (1) all FBFM grain farms combined, (2) small FBFM grain farms, (3) midsize FBFM grain farms, and (4) large FBFM grain farms.

Demographics of FBFM Grain Farms

The farm operator's age in the dataset used in this study generally ranges from 26 years to 79 years with an average age of 59 years. An average of 3 members in the farm operator's household remained the same across the different farm sizes with a total range of 1 to 11 members in the FBFM grain farms. Age and household size are used as control variables in the binary logistic regression model to understand whether they have an impacts on the farm's term debt repayment ability.

Table 2

Descriptive Statistics of Selected Demographics of FBFM Grain Farms by Farm Size

Selected Demographics	Small	Midsize	Large	All Farms
Farm operator's age (years)				
Range	27 to 79	26 to 79	31 to 79	26 to 79
Mean	60	58	57	59
Standard Deviation	14.15	10.95	9.55	12
Household size (people)				
Range	1 to 11	1 to 9	1 to 8	1 to 11
Mean	3	3	3	3
Standard Deviation	1.32	1.33	1.37	1.34

Gross Farm Returns and Debt of FBFM Grain Farms

Gross farm returns was used in place of gross cash farm income for the grouping of the grain farms into small, midsize and large since the financial statements of FBFM grain farms were reported on accrual basis. The range of gross farm returns for FBFM grain farms was 46,263 to 3,949,985, and the mean was 664,262 (Appendix A[7]). Farm debt ranges from $755 to $9,834,159 with a mean of $918,807 (Appendix A). Comparative values of gross farm returns and total debt for the small, midsize and large FBFM grain farms are displayed in Figure 8. Large FBFM grain farms generated the highest gross farm returns with a mean of $1,497,721, and small FBFM grain farms generated the lowest gross farm returns with a mean of $220,760. Results were similar for debt, where large FBFM grain farms had the highest mean of $1,906,827, and small FBFM grain farms had the lowest mean with an average of $323,553. The mean value for debt for all FBFM grain farms combined was $918,807.

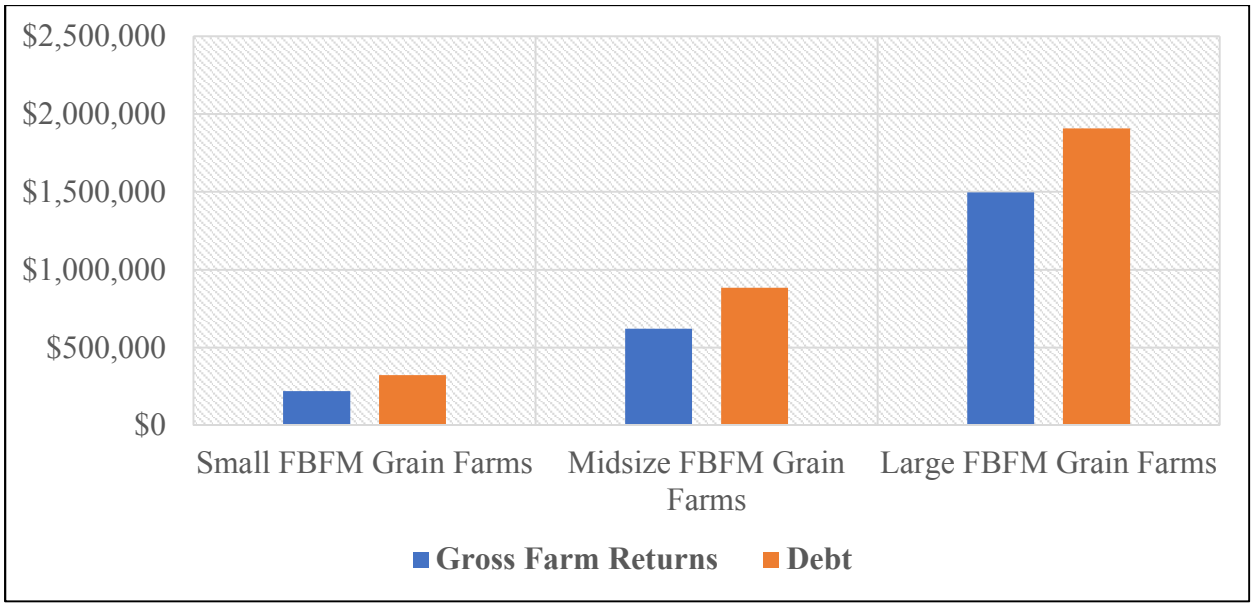

Figure 8: Mean Values of Gross Farm Returns and Debt of FBFM Grain Farms by Farm Size

[7]Appendix A presents some statistics including the range, mean and standard deviation for selected financial variables obtained from the financial statements of FBFM grain farms. Values are presented for three groups of farms classified by farm size.

Net Farm Income and Family Living Expenses of FBFM Grain Farms

The mean value of net farm income for the 1,566 FBFM grain farms was $47,529 (Appendix A), and most farms in the database reported net farm income less than $200,000. Alternatively, the mean value of family living expenses for FBFM grain farms was $89,896 (Appendix A). Mean net farm income was 47 percent less than the mean of family living expenses of FBFM grain farms. Mean values for net farm income and family living expenditures for small, midsize and large FBFM grain farms are presented in Figure 9. The group with the highest mean for net farm income was the large farm group with a mean value of $98,747 followed by the midsize group with a mean value of $46,571. Small FBFM grain farms had the lowest net farm income figure with a mean of $16,879. A similar relationship was observed for family living expenditures. Large FBFM grain farms had mean family living expenditures of $113,862, midsize FBFM grain farms had mean family living expenditures of $88,590 and small FBFM grain farms had mean family living expenditures of $77,268.

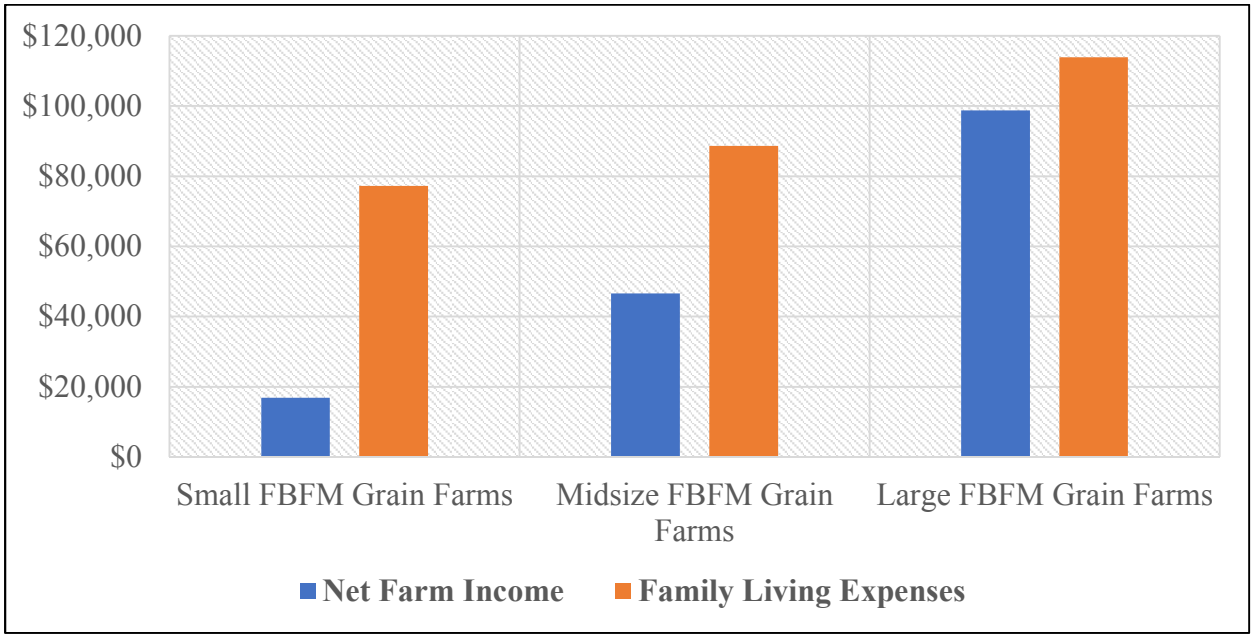

Figure 9: Mean Values of Net Farm Income and Family Living Expenses of FBFM Grain Farms by Farm Size

Farm Financial Ratios

Following FFSC guidelines, selected financial ratios were computed for all FBFM grain farms and for each of the three size categories (Table 3). Working capital to gross revenue was highest for small farms, with a mean of 0.83, and lowest for large farms, with a mean of 0.44. The figures indicate that small farms had $0.83 of working capital for each dollar of gross revenue, whereas large farms had $0.44 of working capital for each dollar of gross revenue. The FFSC recommends that working capital to gross revenue be used as a measure of liquidity, where higher values suggest greater liquidity.

The mean value for return on farm assets for all FBFM grain farms was 0.017 or 1.7 percent. When comparing categories, all three categories had mean values of 1.7 percent. This indicates that FBFM grain farms had $0.017 of return to farm assets for each dollar of business assets. The FFSC recommends that return on farm assets be used as a measure of profitability, where higher values suggest greater profitability. In 2016, the average rate of return on assets for FBFM grain farms was 1.6 percent. This indicates that, the average rate of return on farm assets of FBFM grain farms has not change significantly.

The mean debt to asset ratio for all FBFM grain farms was 0.24. By size category, small farms possessed the smallest debt to asset ratio with a mean of 0.19, and large farms possessed the largest debt to asset ratio with a mean of 0.29. Those figures indicate that small farms had $0.19 of farm debt for each dollar of farm assets, and large farms had $0.29 of farm debt for each dollar of farm assets. The FFSC recommends that the debt to asset ratio be used to monitor solvency, with lower values representing greater solvency.

The mean asset turnover ratio for all FBFM grain farms was 0.20. As expected, small farms had the lowest asset turnover ratio with a mean of 0.15, and large farms had the highest

asset turnover ratio with a mean of 0.26. Those figures reveal that, small farms had $0.15 of gross revenues for each dollar of farm assets, and large farms had $0.26 of gross revenues for each dollar of farm assets. The FFSC recommends that the asset turnover ratio be a measure of financial efficiency, with higher values reflecting greater efficiency.

Table 3

Selected Financial Measures of FBFM Grain Farms by Farm Size

Financial Ratios	Small	Midsize	Large	All Farms
Working Capital to Gross Revenue				
Range	(3.01) to 19.15	(1.39) to 5.8	(1.47) to 2.43	(3.01) to 19.15
Mean	0.83	0.54	0.44	0.60
Standard Deviation	1.72	0.78	0.58	1.10
Return on Farm Assets				
Range	(0.12) to 0.36	(0.18) to 0.27	(0.09) to 0.17	(0.18) to 0.36
Mean	0.017	0.017	0.017	0.017
Standard Deviation	0.04	0.04	0.03	0.04
Debt to Asset				
Range	0.001 to 0.78	0.002 to 1.00	0.015 to 0.90	0.001 to 1.00
Mean	0.19	0.26	0.29	0.24
Standard Deviation	0.16	0.17	0.17	0.17
Asset Turnover				
Range	0.008 to 1.05	0.04 to 1.13	0.06 to 1.04	0.008 to 1.21
Mean	0.15	0.20	0.26	0.20
Standard Deviation	0.13	0.12	0.15	0.14

Analysis of the term debt coverage ratio revealed that only 9.5 percent of FBFM grain farms (149 of 1,566) had a ratio that was equal to or exceeded 1 (Table 4). The mean term debt coverage ratio for farms with a ratio equal to or greater than 1 was 103.60, whereas the mean term debt coverage ratio for farms with a ratio less than one was -11.02. The results suggest that 1,417 out of 1,566 FBFM grain farms potentially had insufficient funds to service term debt.

Table 4

Descriptive Statistics for Term Debt Coverage Ratio (Dependent Variable)

Term Debt Coverage Ratio	Mean	Frequency	Percent
< 1	-11.02	1,417	90.5
≥1	103.60	149	9.5
Total	-0.19	1,566	100

Binary Logistic Regression Results

As stated in the data analysis section, a binary logistic regression model was used in this study to estimate the effects of selected financial measures, family living expenses, household size, farm operator's age and acres operated on term debt repayment ability of Illinois grain farms. The next set of tables in this section presents results from the model as being used to estimate the predictors of debt repayment ability of small FBFM grain farms, midsize FBFM grain farms, large FBFM grain farms and all FBFM grain farms.

Table 5

Binary Logistic Regression Results for All FBFM Grain Farms

Independent Variables	Coefficient	Std. Err.	P>z	[95% Conf.	Interval]
Working Capital to gross revenue	.07683	.0696	0.270	-.0596	.2133
Return on farm assets	25.0604***	4.1599	0.000	16.9071	33.2136
Debt to asset	-12.6046***	1.3673	0.000	-15.2844	-9.9247
Asset turnover	-3.8993***	1.4114	0.006	-6.6655	-1.1330
Family living expenses	-.000011***	2.96e-06	0.000	-.00001	-5.23e-06
Household size	.0857	.0821	0.297	-.0754	.2467
Farm operator's age	-.0237**	.0108	0.028	-.0448	-.0025
Acres operated	.0005***	.0001	0.000	.0003	.0007
Constant	1.1348	.8798	0.197	-.5895	2.8591

(table continues)

Independent Variables	Coefficient	Std. Err.	P>z	[95% Conf.	Interval]
Number of Observations =1,566					
LR chi2 (8) = 285.10					
Prob > chi2 = 0.0000					
Pseudo R2 = 0.2883					

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

In estimating the predictors of the term repayment ability of FBFM grains farms, the selected financial measures, family living expenses, household size, farm operator's age and acres operated were all included in the binary logistic regression model as independent variables. The model proved to be statistically significant in estimating the predictors that affect the dependent variable. From the results, there was Pseudo R2 of 0.2883 which means that, 28.83% variance in the response variable is explained by the model. Six predictors were found to be statistically significant. Return on farm assets, debt to asset, asset turnover, family living expenses and acres operated were statistically significant at 1% level whilst farm operator's age was significant at 5% level.

Conclusively, the key financial measures that affect the term debt repayment ability of FBFM grain farms are return on farm assets, debt to asset ratio and asset turnover. This answers the first objective of our study as well as correspond to the results from existing literature on drivers of repayment ability of farms (Zech and Pederson, 2003; Durguner and Katchova, 2007). Working capital to gross revenue was insignificant in estimating the term repayment ability of grain farms even though it was a significant factor in other studies including Durguner and Katchova in 2007. The results also answer the second objective as family living expenses was identified as a significant predictor of term debt repayment ability of FBFM grain farms. Its impact is however negative which means an increase in family living expenses will reduce the term debt coverage ratio of an FBFM grain farm.

Using the averages of the independent variables computed for FBFM grain farms in addition to the estimated logistic regression coefficients, the logistic regression model[8] predicts that the probability that a FBFM grain farm being sufficient to service term debt is 2%.

Table 6

Odds Ratio Results for All FBFM Grain Farms

Independent Variables	Odds Ratio	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	1.0799	.0752	0.270	.9421	1.2377
Return on farm assets	7.65e+10***	3.18e+11	0.000	2.20e+07	2.66e+14
Debt to asset	3.36e-06***	4.59e-06	0.000	2.30e-07	.00005
Asset turnover	.0203***	.0286	0.006	.0013	.3221
Family living expenses	.9999***	2.96e-06	0.000	.9999	.9999
Household size	1.0894	.0895	0.297	.9273	1.2798
Farm operator's age	.9766**	.0105	0.028	.9561	.9974
Acres operated	1.0004***	.0001	0.000	1.0002	1.0007
Constant	3.1105	2.7366	0.197	.5545	17.4464

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

In Table 6, the odd ratios of the various independent variables are presented. From Table 5, six independent variables were identified to be significant to the term debt repayment ability of FBFM grain farms. The same results were obtained from computing the odds ratios for the independent variables. However, in this particular table, the odd ratios are interpreted differently from the coefficients in the other table. The odds ratio shows the relationship between the probability of a FBFM grain farm being sufficient to service debt and the probability of a farm being insufficient to service debt. In this study, the odds ratio for a particular independent variable is interpreted as how much change in the estimated odds of a FBFM grain farm being sufficient to service term debt is caused by a unit change in that particular independent variable.

[8] logistic regression model, Probability = $(e^{1.134796+0.0768329*WCGR+25.0604*ROA-12.60458*DTA-3.899261*ATR-0.000011*FLE+0.0004847*ACR+0.0856647*SIZE-0.0237089*AGE}) / (1+ e^{1.134796+0.0768329*WCGR+25.0604*ROA-12.60458*DTA-3.899261*ATR-0.000011*FLE+0.0004847*ACR+0.0856647*SIZE-0.0237089*AGE})$

From Table 6, the odds ratio of 0.9999 means that, one unit increase in family living expenses will reduce the estimated odds of a farm being sufficient to service term debt by 0.01%. So, if a farm spends additional $20,000 on family expenses, a FBFM grain farm's estimated odds of being sufficient in servicing term debt is reduced by 19.7%[9].

With acres operated, since the odds ratio (1.0004) was more than one, one unit increase in the ratio will increase the estimated odds of the farm being sufficient to service term debt by 0.04%. In other words, if a farm increases its operation by 1,000 acres, the estimated odds of the farm being sufficient to service term debt is increased by 62.4%[10].

The odds ratio for farm operator's age (0.9766) was less than one in the model and this indicates a negative relationship. Therefore, a unit increase in farm operator's age will reduce the estimated odds of a farm being sufficient to service term debt by 2.34% which also means that if a farm operator is older by 10 years, the farm's estimated odds of servicing term debt is reduced by 21.1%[11].

[9] 19.7% is computed by $e^{\text{coefficient of family living expenses} * \text{specified value for family expenses}} = e^{0.000011*20,000} = 0.803$ which is subtracted from 1 to obtain 0.197 or 19.7%

[10] 62.4% is computed by $e^{\text{coefficient of acres operated} * \text{specified value for acres operated}} = e^{1.000485*1,000} = 1.624$. One is subtracted from the results to obtain 0.624 or 62.4.

[11] 21.1% is computed by $e^{\text{coefficient of farm operator's age} * \text{specified value for farm operator's age}} = e^{-0.0237089*10} = 0.789$ which is subtracted from 1 to obtain 0.211 or 21.1%

Table 7

Binary Logistic Regression Results for Small FBFM Grain Farms

Independent Variables	Coefficient	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	.0217	.0963	0.822	-.1671	.2104
Return on farm assets	24.4763**	10.2786	0.017	4.3307	44.6219
Debt to asset	-12.0525***	3.2330	0.000	-18.3891	-5.7158
Asset turnover	-8.0001**	4.0385	0.048	-15.9155	-.0848
Family living expenses	-.000003	6.88e-06	0.666	-.00002	.00001
Household size	.1850	.1473	0.209	-.1036	.4737
Farm operator's age	-.0237	.0193	0.219	-.0615	.0141
Acres operated	.000008	.0003	0.978	-.0006	.0006
Constant	.4613	1.6168	0.775	-2.7074	3.6301

Number of Observations = 431

LR chi2 (8) = 44.20
Prob > chi2 = 0.0000
Pseudo R2 = 0.193

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

The predictors which had significant impact on the term debt coverage ratio for small FBFM grain farms are return on farm assets, debt to asset and asset turnover. Debt to asset ratio remained significant at 1% level with this category of farm size. The relationship between the debt to asset and term debt coverage ratio was also negative for small farms. Return on farm asset and asset turnover were both significant at a 5% level. Working capital to gross revenue and family living expenses were statistically insignificant predictors of the term debt repayment ability of small farms.

Table 8

Odds Ratio Results for Small FBFM Grain Farms

Independent Variables	Odds Ratio	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	1.0219	.0984	0.822	.8461	1.2342
Return on farm assets	4.27e+10**	4.38e+11	0.017	75.9997	2.39e+19
Debt to asset	5.83e-06***	.00001	0.000	1.03e-08	.0033
Asset turnover	.0003**	.0014	0.048	1.22e-07	.9187
Total family living expenses	.9999	6.88e-06	0.666	.9999	1.00001
Household size	1.2033	.1772	0.209	.9015	1.6059
Age	.9766	.01883	0.219	.9404	1.0142
Acres operated	1.00001	.0003	0.978	.9994	1.0006
Constant	1.5862	2.5644	0.775	.0667	37.7165

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

In the odds ratio table for small farms, the odds ratio for debt to asset was 0.0000058. This means one unit increase in debt to asset will reduce the estimated odds of a small farm being sufficient by approximately 99.99%. The odds ratio of 0.0003354 for asset turnover means that one unit increase in asset turnover reduces the estimated odds of a small farm being sufficient to service term debt by 99.77%.

Table 9

Binary Logistic Regression Results for Midsize FBFM Grain Farms

Independent Variables	Coefficient	Std. Err.	P>z	[95%Conf.	Interval]
Working capital to gross revenue	.3405*	.1839	0.064	-.0199	.7009
Return on farm assets	30.6023***	5.6526	0.000	19.5234	41.6811
Debt to asset	-13.5838***	2.0370	0.000	-17.5763	-9.5912
Asset turnover	-4.2461**	1.9489	0.029	-8.0659	-.4264
Family living expenses	-.00002***	4.90e-06	0.000	-.00003	-.00001
Household size	.1436	.1165	0.218	-.0847	.3720
Farm operator's age	-.0387**	.0169	0.022	-.0720	-.0055
Acres operated	.0004***	.0002	0.008	.0001	.0008

(table continues)

Independent Variables	Coefficient	Std. Err.	P>z	[95%Conf.	Interval]
Constant	2.7405	1.4688	0.062	-.1383	5.6193
Number of Observations= 861 LR chi2 (8) = 220.73 Prob > chi2 = 0.0000 Pseudo R2= 0.3771					

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

Independent variables including working capital to gross revenue, return on farm assets, debt to asset, asset turnover, acres operated, family living expenses and farm operator's age were significant predictors of the term debt repayment ability of midsize grain farms. The Pseudo R2 value of 0.3771 also showed that, 37.71% variance in the response variable is explained by the model. Working capital to gross revenue was positively significant in predicting the term debt repayment ability of midsize farms at 10% level. Asset turnover and farm operator's age were significant at 5% level in estimating the term debt repayment ability of midsize farms. On the other hand, debt to asset and family living expenses were negatively significant at 1% level as return on farm assets and acres operated was positively significant at 1% level.

Table 10

Odds Ratio Results for Midsize FBFM Grain Farms

Independent Variables	Odds Ratio	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	1.4057*	.2585	0.064	.9803	2.0157
Return on farm assets	1.95e+13***	1.10e+14	0.000	3.01e+08	1.26e+18
Debt to asset	1.26e-06***	2.57e-06	0.000	2.33e-08	.00007
Asset turnover	.0143**	.0279	0.029	.0003	.6528
Family living expenses	.9999***	4.90e-06	0.000	.9999	.9999
Household size	1.1545	.1345	0.218	.9187	1.4507
Farm operator's age	.9619**	.0163	0.022	.9305	.9945
Acres operated	1.0004***	.0002	0.008	1.0001	1.0007
Constant	15.4949	22.7589	0.062	.8709	275.6973

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

The odds ratio for the debt to asset ratio shows that, one unit increase in the debt to asset will reduce the estimated odds of a midsize FBFM grain farm being sufficient to service term debt by approximately 99.99%. Under family living expenses, one unit increase in this independent variable will reduce the estimated odds of a midsize farm being sufficient in servicing term debt by 0.002%. So, if a midsize FBFM grain farm spends additional $20,000 on family living expenses, the estimated odds of the farm being sufficient to service term debt is reduced by 34.3%.

Table 11

Binary Logistic Regression Results for Large FBFM Grain Farms

Independent Variables	Coefficient	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	1.8573**	.7347	0.011	.4173	3.2973
Return on assets	57.6067***	14.6951	0.000	28.8048	86.4087
Debt to asset	-9.3778**	4.1820	0.025	-17.5745	-1.1812
Asset turnover	-5.4490	3.4416	0.113	-12.1946	1.2966
Family living expenses	-.00002**	7.27e-06	0.016	-.00003	-3.33e-06
Household size	-.3873	.2460	0.115	-.8694	.0949
Farm operator's age	-.0509	.0326	0.119	-.1148	.0130
Acres operated	-.0001	.0004	0.779	-.0009	.0006
Constant	3.3332	2.8098	0.236	-2.1738	8.8404

Number of Observations = 274
LR chi2 (8) = 87.92
Prob > chi2 = 0.0000
Pseudo R2 = 0.5114

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

With large farms, working capital to gross revenue, return on farm assets and debt to asset were statistically significant predictors of these farms' term debt repayment ability, so were the family living expenses. Return on farm assets had a positive relationship with term debt repayment ability of large farms and was significant at 1% level while working capital to gross revenue was a positive significant variable at 5% level. The other significant predictors including debt to asset

and family living expenses had a negative relationship with the term debt repayment ability of large farms. Both debt to asset and family living expenses were significant at 5% level.

Table 12

Odds Ratio Results for Large FBFM Grain Farms

Independent Variables	Odds Ratio	Std. Err.	P>z	[95% Conf.	Interval]
Working capital to gross revenue	6.4065**	4.7069	0.011	1.5179	27.0398
Return on farm assets	1.04e+25***	1.53e+26	0.000	3.23e+12	3.36e+37
Debt to asset	.0001**	.0004	0.025	2.33e-08	.3069
Asset turnover	.0043	.0148	0.113	5.06e-06	3.6567
Family living expenses	.9999**	7.27e-06	0.016	.9999	.9999
Household size	.6789	.1670	0.115	.4192	1.0996
Farm operator's age	.9504	.0309	0.119	.8915	1.0131
Acres operated	.9999	.0004	0.779	.9991	1.0006
Constant	28.0302	78.7595	0.236	.1137	6907.775

***= Significant at 1%, **=Significant at 5% level, *=Significant at 10% level

In Table 12, results on the odds ratio and the 95% confidence interval for the independent variables are presented. The odds ratio for debt to asset suggests that one unit increase in debt to asset will reduce the estimated odds of a large FBFM grain farm being sufficient to service term debt by approximately 99.99%. On the hand, one unit increase in family living expenses will reduce the estimated odds of a large FBFM grain farm by approximately 0.01%. This means that if a large FBFM grain farm spends additional $20,000 on family living expenses, the estimated odds of this farm being sufficient to service term debt by 29.7%.

CHAPTER V: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purpose of this study was to understand the impacts of key financial measures that are employed by both lending institutions and researchers on the term debt repayment ability of Illinois grain farms. The economic downturn accompanied by commodity price declines and low farm incomes, especially in the grain sector, has made it essential to take a closer look at grain farms in particular.

Moreover, debt has been on the rise and lending institutions are increasingly tightening their loans and collateral requirements. Increasing family living expenses is also a concern as these withdrawals of equity from the business reduce the availability of funds in the firm. Nevertheless, very limited research has been done to estimate the impact of family living expenses on the cash position of a farm and thus its ability to service term debt. From this study, return on farm assets, debt to asset, asset turnover, acres operated, farm operator's age and family living expenses were identified to be key drivers of the term debt repayment ability of Illinois grain farms as represented by Illinois FBFM grain farms. However, these factors impact the term debt repayment ability of these grain farms differently (both direction and strength of association). A binary logistic regression model proved to be significant in estimating the term debt repayment ability of the FBFM grain farms with six independent variables being significant in predicting the term debt coverage ratio, the dependent variable measuring the term debt repayment ability of the farms.

Return on farm assets and acres operated had a positive relationship with the estimated odds of a FBFM farm being sufficient to service term debt. This finding shows the need to be concerned over profitability of farms since it directly affects the return on farm assets and the

ability to service debt as suggested by this study. The positive relationship between return on farm assets and the term debt repayment ability should inform stakeholders on the need to find options in maximizing net farm income for the purpose of having funds available to make debt payments. This can be accomplished by adopting a better cost control strategy or through a more efficient utilization of farm assets. Debt to asset, asset turnover and family living expenses, on the other hand, negatively affected the estimated odds of a FBFM grain farm being sufficient to service term debt. Even though debt financing is important in this capital-intensive farm sector, it is equally important to be cautious on the proportion of debt used to finance farm assets. Debt to asset ratio represents lender's leverage over farm assets and a higher ratio will mean a higher leverage as well. Most research studies have recommended the need to minimize debt to asset ratio after findings of its impact on the farm's debt repayment ability. This study also suggests that debt in relation to the amount used to finance farm assets should be examined prior to servicing debt.

Return on farm assets and debt to asset ratio were significant predictors of the term debt repayment ability across all categories of farms analyzed in this study. For that reason, management and operational activities should be geared towards maximizing net farm income and decreasing debt financing of a farm business. On the other hand, family living expenses was a significant variable that had an impact on the term debt repayment ability of both midsize and large FBFM grain farms but was insignificant for small FBFM grain farms. Overall, family living expenses was a significant factor and negatively affected the estimated odds of a FBFM grain farm being sufficient to service term debt. Moreover, family living expenses caused a greater reduction in the estimated odds of a midsize FBFM grain farm being sufficient to service term debt as compared to large FBFM grain farms.

Recommendations

Grain farms in Illinois are currently exposed to declining price levels and lower net farm income levels which can be clearly noticed from the lower rate of return on assets as compared to the farm sector. The persistence of this trend suggests that grain producers should focus on cost control and efficiency of asset utilization to increase net farm income. Prior to undertaking additional debt, farm managers should conduct a clear assessment of the current amount of debt in the farm business since the continued declines in commodity prices and farm incomes have been depleting farms' financial cushions. Stakeholders in the farm sector, especially lending institutions, should also consider family living expenses as an important driver of the term debt repayment ability of farms and should use the existing research as evidence to communicate to their borrowers the impact of these withdrawals on their operation's ability to service debt. The applied nature of the numerical findings of this study (e.g., percent change in the odds of the farm being sufficient in servicing its term debt when family living expenses go down by a certain amount) can be used by lenders, extension specialists, etc. in meetings with producers to indicate the potential impact of additional equity withdrawals and changes in their lifestyle on the farm's ability to service debt. Cash outflows from the business, which is used on activities unrelated to the farm business, do not help generate income and reduce the funds available to make debt payments. It is however, equally important for farm owners and operators to take steps to control their family living expenses.

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APPENDIX A: FINANCIAL CHARACTERISTICS OF ILLINOIS FBFM GRAIN FARMS

In Appendix A, a summary of the selected financial indicators of the performance and position of FBFM grain farms are presented. The farms have also been categorized into different farm sizes by their gross farm returns to fully understand the characteristics of the farm sizes in the Illinois based on the USDA farm typology ranges.

Farm Sizes	Small	Midsize	Large	All Farms
Number of Farms	431 (28%)	861 (55%)	274 (17%)	1,566(100%)
	$	$	$	$
Gross Farm Returns				
Range	46,263 to 349,498	350,021 to 999,653	1,000,991 to 3,349,985	46,263 to 3,949,985
Mean	220,760	621,035	1,497,721	664,262
Standard Deviation	79,892.42	182,570.5	558,315.8	501,262.2543
Total Family Living Expenses				
Range	40,023 to 289,694	40,097 to 344,855	40,183 to 334,116	40,023 to 344,855
Mean	77,268	88,590	113,862	89,896
Standard Deviation	32,984.48	37,913.64	51,625.91	41,221.14
Acres Operated				
Range	28 to 5,011	281 to 5,147	1,114 to 6,304	28 to 6,304
Mean	680	1,259	2,467	1,311
Standard Deviation	660.90	657.16	981.32	932.91
Total Operating Expenses				
Range	7,420 to 445,238	45,776 to 1,070,577	528,540 to 3,661,976	7,420 to 3,661,976
Mean	164,285	466,099	1,162,306	504,847
Standard Deviation	72,870.2	164,057.7	492,613.5	408,689.13

(table continues)

Farm sizes	Small	Midsize	Large	All Farms
Net Farm Income				
Range	(172,421) to 171,532	(409,647) to 385,093	(578,801) to 912,526	(578,801) to 912,526
Mean	16,879	46,571	98,747	47,529
Standard Deviation	45,633.18	96,063.34	198,709.2	115,107
Total Assets				
Range	90,300 to 17,579,013	384,278 to 15,171,228	1,563,828 to 24,384,488	90,300 to 24,384,488
Mean	2,312,256	4,079,630	7,189,324	4,137,305
Standard Deviation	1,808,431	2,460,312	3,809,772	3,050,700.31
Total Debt				
Range	755 to 2,604,411	8,951 to 4,675,150	87,020 to 9,834,159	755 to 9,834,159
Mean	323,553	885,174	1,906,827	918,807
Standard Deviation	320,405.2	674,578.3	1,472,665	972,056.1