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Financial Conditions in the U.S. Agricultural Sector: Historical Comparisons

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Financial Conditions in the U.S. Agricultural Sector: Historical Comparisons

Nigel Key, Christopher Burns, and Greg Lyons

Abstract

Recent economic conditions and the financial health of the U.S. farm sector have raised concerns among farm policy stakeholders. After peaking around 2012, farm sector income declined while farm debt continued to rise. Farm real estate stopped rapidly appreciating in value, and land prices declined in some regions. Between 2016 and early 2019, interest rates rose—increasing the cost of borrowing for some farmers. Lower commodity prices in the near future would make it more difficult for some farmers to meet their loan obligations and pay for production expenses. Farmers who made substantial investments in machinery or land when commodity prices and farm incomes were high could face elevated risks of financial insolvency. This study compares recent sectoral and farm-level measures of financial performance relative to historic levels to better understand the severity of the current downturn in the agricultural economy. Using data from USDA's Agricultural Resource Management Survey, researchers disaggregate farm-level measures of financial health across farm types to identify the types of farms that are under the greatest financial stress. To provide additional perspective on the financial health of the sector, the study uses data from agricultural lenders to compare current agricultural loan delinquencies to levels in the recent past. Finally, model results on the effects of a hypothetical decline in gross farm income are used to evaluate the types of farm operations that would be most vulnerable to a further downturn in the agricultural economy.

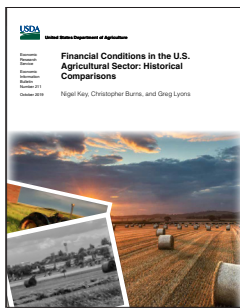
Keywords: Farm financial performance, farm income, debt, liquidity, loan repayment capacity, working capital, solvency, debt-to-asset ratio, agricultural lending, default rate, financial stress

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Financial Conditions in the U.S. Agricultural Sector: Historical Comparisons

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What Is the Issue?

Recent economic conditions have raised concerns about the financial health of the U.S. farm sector. After peaking around 2012, farm sector income declined while farm debt continued to rise. Farm real estate is no longer rapidly appreciating in value, and land prices have declined in some regions. Between 2016 and early 2019, interest rates rose—increasing the cost of borrowing for some farmers. Lower commodity prices in the near future would make it more difficult for some farmers to meet their loan obligations and pay for production expenses. Farmers who made substantial investments in land or machinery when commodity prices and farm incomes were high could face elevated risks of financial insolvency. The objectives of this study are to determine how current economic conditions in the farm sector compare with those in past periods of financial stress, to assess potential problems ahead in terms of loan defaults or bankruptcies, and to determine which types of farms are financially vulnerable now and which would be likely to face the biggest challenges in the years ahead if commodity prices decline further.

What Did the Study Find?

Sectoral measures of farm finances indicate a deterioration in economic conditions since 2012, yet most measures are near long-run (1970-2017) average levels:

- From 2012 to 2017, the farm sector saw the largest multiyear decline in net cash income in percentage terms since the 1970s. However, farm income fell from a near-record level so that, despite the large drop, inflation-adjusted income remains close to the long-run average.
- Farm sector debt is again near peak levels of the late 1970s and early 1980s. In 2018, interest expenses were forecast to be 23 percent above the average levels from 2000 to 2017, but remain 8 percent below long-run average levels because of historically low interest rates.
- In recent decades, farm assets (especially farmland) have appreciated more rapidly than debt. As a result, the farm sector's debt-to-asset ratio has fallen since the mid-1980s and reached a historic low in 2012. Since then, the market for land has weakened in some regions and the debt-to-asset ratio has trended upward. The debt-to-asset ratio is now above its 10-year average, though it remains low compared to the 1970-2017 average.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

Farm-level measures of solvency, liquidity, and repayment capacity indicate that 85-90 percent of farms in each category are not categorized as under financial stress. However, farms with at least \$100,000 in annual sales are more likely to be under financial stress than smaller scale operations because these larger operations derive more of their income from the farm and take on relatively more farm business debt. Among farms with at least \$100,000 in annual sales, the share facing financial stress (having a low repayment capacity or low levels of solvency) has increased since 2012. For example, the share of farms with at least \$500,000 in annual sales with a low repayment capacity (income available to pay debt is less than the principal and interest owed) increased from 8.1 percent in 2012 to 12.4 percent in 2017, and the share with a low level of solvency (debt-to-asset ratio greater than 55 percent) increased from 7.6 to 13.5 percent. However, for these larger farms, the levels of financial stress are currently near 1996-2017 average levels and not as severe as levels seen in 2002 (the year with the lowest net cash farm income since 1996).

Increases in financial stress in the farm sector have recently begun to be reflected in loan delinquency rates. In particular, delinquency rates for both Farm Credit System (FCS) and commercial bank loans have ticked upward since 2015. However, these delinquency rates remain below historical averages and below levels seen from 2010 to 2013, when delinquency rates rose in the wake of the housing crisis and Great Recession.

To gain insight into how farms would be affected if farm income continued to decline in the years ahead, the study simulates the effect of a decline in gross farm income on the share of farms in “extreme financial stress”—defined as not having enough household income to meet current loan payments and a debt-to-asset ratio greater than 55 percent. If gross cash farm income were to fall by 10 or 20 percent from 2017 levels, the share of all farms in extreme financial stress would increase from 1.1 percent in 2017 to 1.3 and 1.6 percent, respectively. However, these effects would increase relatively more for larger scale farms, for farms with a principal operator under age 40, and for dairy farms.

How Was the Study Conducted?

This study examines the financial health of the U.S. farm sector by comparing current measures of farm financial performance relative to those of historic levels and of past periods of extreme financial stress. Using sectoral data, researchers analyzed trends in farm income, debt, interest expenses, interest rates, real estate values, and the debt-to-asset ratio. Farm-level data from USDA’s 1996-2017 Agricultural Resource Management Survey (ARMS) and the 2014 Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey were used to identify the types of operations currently under the most financial stress. Trends in measures of loan repayment capacity, working capital, and solvency for farms that vary by income, commodity specialization, and operator age and experience were also compared over time. Using data from lenders, researchers also analyzed trends in agricultural real estate and production loan delinquencies for commercial bank, Farm Credit System, and USDA Farm Service Agency loans. Finally, model estimates of the effects of a hypothetical decline in gross farm income were used to identify the types of farm operations most vulnerable to a further downturn in the agricultural economy.

Financial Conditions in the U.S. Agricultural Sector: Historical Comparisons

Introduction

In recent years, many farm operations have faced economic challenges. After peaking around 2012, the prices of many agricultural commodities fell, leading to lower farm incomes. With farm profits dropping, the price of farmland ended its long period of rapid growth, and the rate of appreciation slowed and even fell in real (inflation-adjusted) terms in some regions. At the same time, the Federal Reserve changed its monetary policy stance and interest rates started to rise. Lower commodity prices in the near future could further reduce farm receipts, making it more difficult for some farmers to meet their loan obligations and pay for production expenses. Higher interest rates could compound this problem by increasing loan service obligations for farmers with variable interest rate loans.¹ Farm real estate is the most important source of wealth and source of collateral for most farms. Farmers who made substantial investments in land when commodity and land prices were high could face a drop in liquidity and elevated risks of financial insolvency if farm income continues to fall. How vulnerable might the farm sector be to a further decline in commodity prices or rise in interest rates? What types of farms are likely to face the biggest challenges in the years ahead?

This study examines the financial health of the U.S. farm sector by comparing measures of financial performance relative to their historic levels and to past periods of financial stress. Historical comparisons provide a useful perspective on the severity of current economic conditions for farmers and the agricultural financial system (FDIC, 1997; Gabriel, 2017; Zhang and Tidgren, 2018). This study uses farm-level survey data to provide information about the types of farm operations under the most financial stress. It also compares current agricultural loan delinquencies to levels in the recent past to gain additional perspective on the financial health of the farm sector. Finally, the study simulates the effects of a hypothetical decline in gross cash farm income to help identify the types of operations (differentiated by farm size, commodity specialization, and age and experience of operator) most vulnerable to a further downturn in the agricultural economy.

¹From 2007 to 2017, over half of all farm real estate loans at commercial banks were variable rate loans (Kauffman and Kreitman, 2018).

Indicators of Farm Sector Financial Conditions

Aggregate data on the farm sector—including measures of farm income, debt, interest expenses, interest rates, real estate values, and the debt-to-asset ratio—provide a perspective on current financial conditions relative to historical levels. The data are indicators of the economic performance and financial health of farm businesses and allow for comparisons to be made over time and to previous periods of financial stress.

Net cash farm income

Net cash farm income, a broad measure of profits, is a widely used measure of farm financial conditions. Farm sector net cash income is defined as annual income from cash receipts, cash farm-related income, and Government farm program payments minus cash expenses paid during the year. It is a measure of the profitability of farming and, hence, the ability of farmers to invest in new machinery, remain in production, expand their operations, and provide for family living expenses. Beginning in 2010, inflation-adjusted farm sector net cash income rose to near-record highs, peaking in 2012 (fig. 1).² Much of this growth was due to commodity cash receipts, which increased 34 percent from 2009 to 2014. This change in receipts was driven largely by higher commodity prices, reflecting increased domestic demand for biofuels and increased foreign demand for agricultural commodities, as well as higher corn and soybean prices due to a drought in the Midwest and Great Plains in 2012.

After peaking in 2012, the sector's net cash farm income started to decline. Prices received by farmers for all major commodities fell, with many (such as prices for corn, wheat, and milk) dropping 30 percent or more. Driven by lower commodity prices, farm incomes fell more sharply in 2015 and continued to decline in 2016. Income in 2017 rebounded from the 2016 level but in 2018, inflation-adjusted net farm income was forecast to fall 12 percent. The forecast decline reflects an expected increase in total production expenses.

From 2012 to 2017, farm sector net cash income fell 34 percent in real terms. This is the largest multiyear decline since the 1970s in percentage terms. However, the declines are less severe than the drop in net farm income that preceded the 1980s farm crisis. Between 1973 and 1981, net cash farm income fell by 52 percent in real terms. Also, while the recent fall in income has been large, it fell from near record-high levels in 2013. Consequently, income remains close to long-run average levels. After adjusting for inflation, the sector's net income in 2018 is forecast to be 8 percent below the average across 1970-2017.

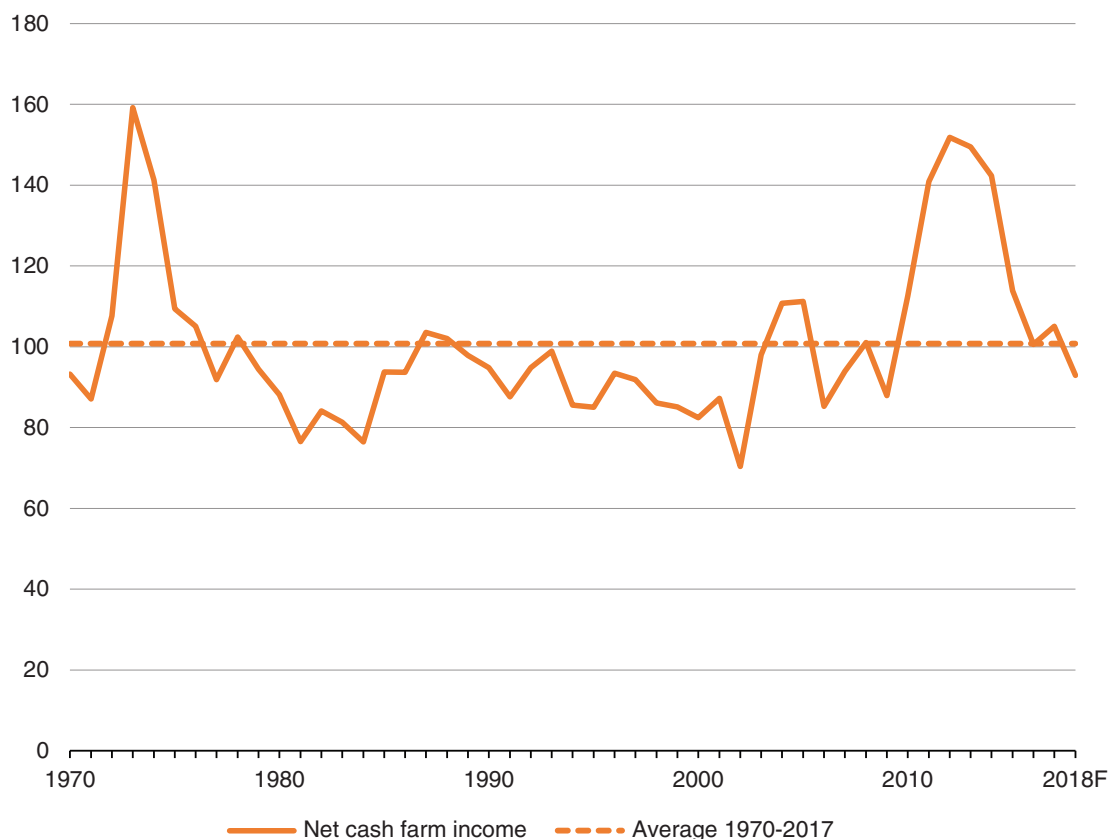
It is worth noting that the fall in net cash farm income understates, to some extent, the severity of the downturn. Farmers can manage the timing of crop and livestock sales and capital purchases to raise their cash incomes when prices or yields are low. In fact, at the sectoral level, farmers drew down their inventories (crops and livestock) in 2016, 2017, and 2018. Without drawing down inventories, cash income would have been 5 percent, 5 percent, and 8 percent lower in those years. Of course, there is a limit to how long inventories can be drawn down without being replenished.

²Monetary values are deflated using the U.S. Bureau of Economic Analysis chain-type gross domestic product (GDP) deflator.

Figure 1

Net cash farm income forecast to fall below 1970-2017 average level

Billion dollars



Note: F= forecast. All values expressed in 2018 dollars deflated using the U.S. Bureau of Economic Analysis chain-type gross domestic product deflator.

Source: USDA, Economic Research Service, Farm Income and Wealth Statistics. Data as of April 22, 2019.

Farm debt and interest expenses

Since the farm crisis of the 1980s, much attention has been paid to farm sector debt and interest expenses. In the 1970s, farmers increased their borrowing to purchase land, equipment, and other inputs to take advantage of high commodity prices. The combination of rising farm income and inflation led to rapid increases in farm real estate values. At the same time, the economy experienced rapid price inflation and rising interest rates. High levels of debt and rising interest rates caused the farm sector’s interest expenses to reach record levels by 1980. In the decade that followed, commodity and farmland prices fell, and many heavily indebted farmers who faced high interest expenses defaulted on loans and went out of business. High loan default rates resulted in a large number of agricultural bank failures in the 1980s (FDIC, 1997).

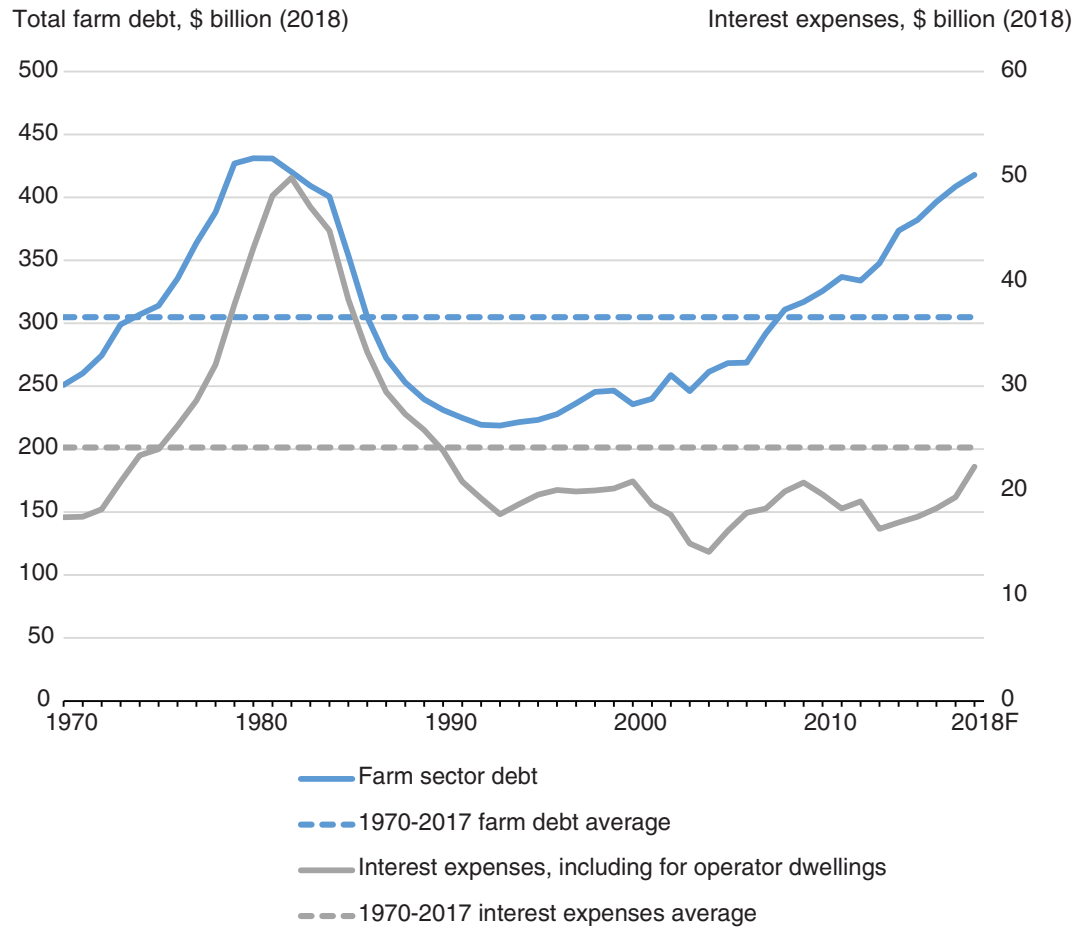
Do recent trends in debt and interest payments suggest the farm sector may soon face another pending farm crisis? From 1994 to 2017, inflation-adjusted farm debt increased by 81 percent, or about 3 percent per year on average (fig. 2). Farm sector debt is again near the peak levels of the late 1970s and early 1980s. ERS forecast farm debt to increase 2 percent in 2018 and 2019, putting total farm sector debt in 2019 just 1 percent below the peak in 1980 in inflation-adjusted terms.

Controlling for inflation, interest expenses for the sector have remained between \$15 billion and \$20 billion since the early 1990s. However, in recent years, as debt has increased and interest

rates stopped falling, interest expenses trended upward. Between 2014 and 2017, interest expenses increased 18 percent in real terms and are forecast by ERS to increase another 13 percent in 2018. While interest expenses were forecast to remain 7 percent below long-run (1970-2017) average levels, they are 24 percent above the average levels from 2000 to 2017.

Figure 2

Farm sector debt at 30-year high, though interest expenses remain below long-term averages



Note: F= Forecast. All values expressed in 2018 dollars deflated using the U.S. Bureau of Economic Analysis chain-type gross domestic product deflator.

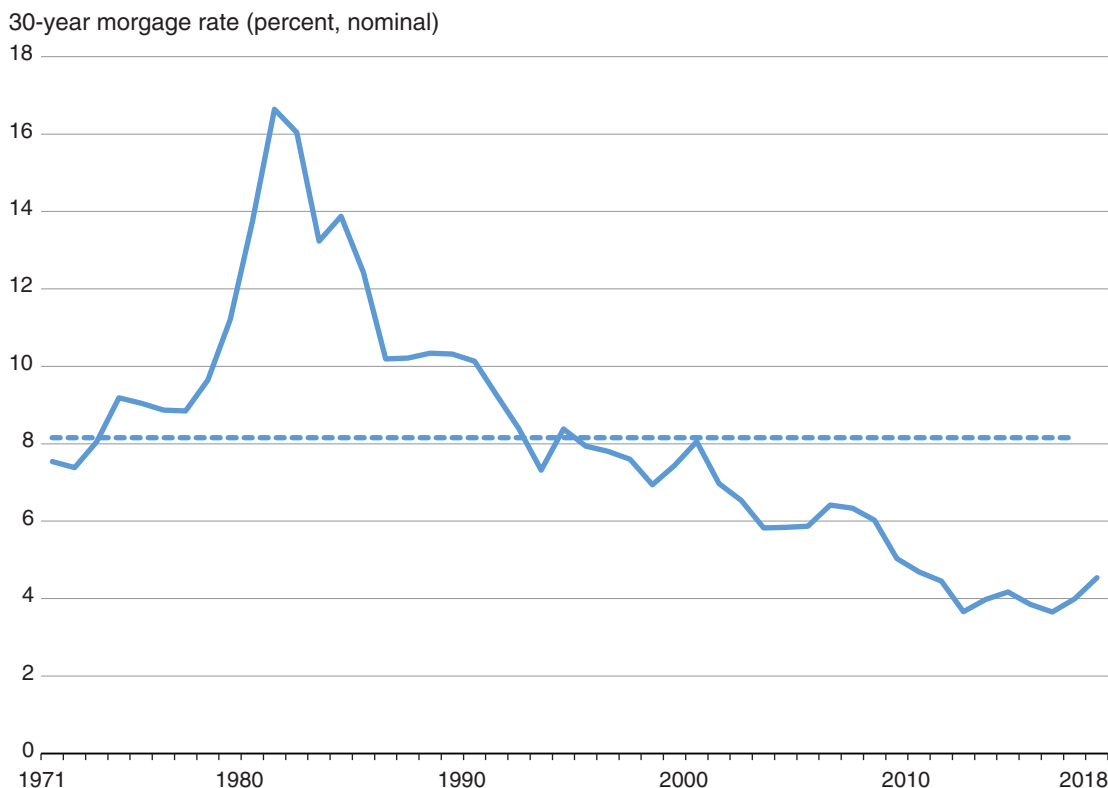
Source: USDA, Economic Research Service, Farm Income and Wealth Statistics. Data as of April 22, 2019.

Despite the large increase in farm debt over the past decades, interest expenses have remained relatively stable since around 1990 primarily due to declining interest rates. Up until recently, interest rates have fallen steadily since peaking in the early 1980s (fig. 3). For example, the 30-year mortgage rate has fallen from over 16 percent in the early 1980s to about 4 percent in recent years. Beginning in December 2015 to July 2018, the Federal Reserve changed its policy course on short-term interest rates and began to gradually increase the Federal funds rate.

Farm real estate

Farm real estate represents the primary input to production and source of wealth for most farms. Farm real estate, which includes agricultural land and the structures on the land, is forecast by ERS to account for over 83 percent of farm-sector assets in 2018 (USDA, ERS, 2019). Because farm real estate is an important input, store of wealth, and source of collateral, its value is a key indicator of the financial well-being of the farm sector. Increasing real estate values generally reflect expectations

Figure 3
Nominal interest rates have declined since the early 1980s



Source: USDA, Economic Research Service using data from Freddie Mac. Accessed online through Federal Research Economic Data (FRED).

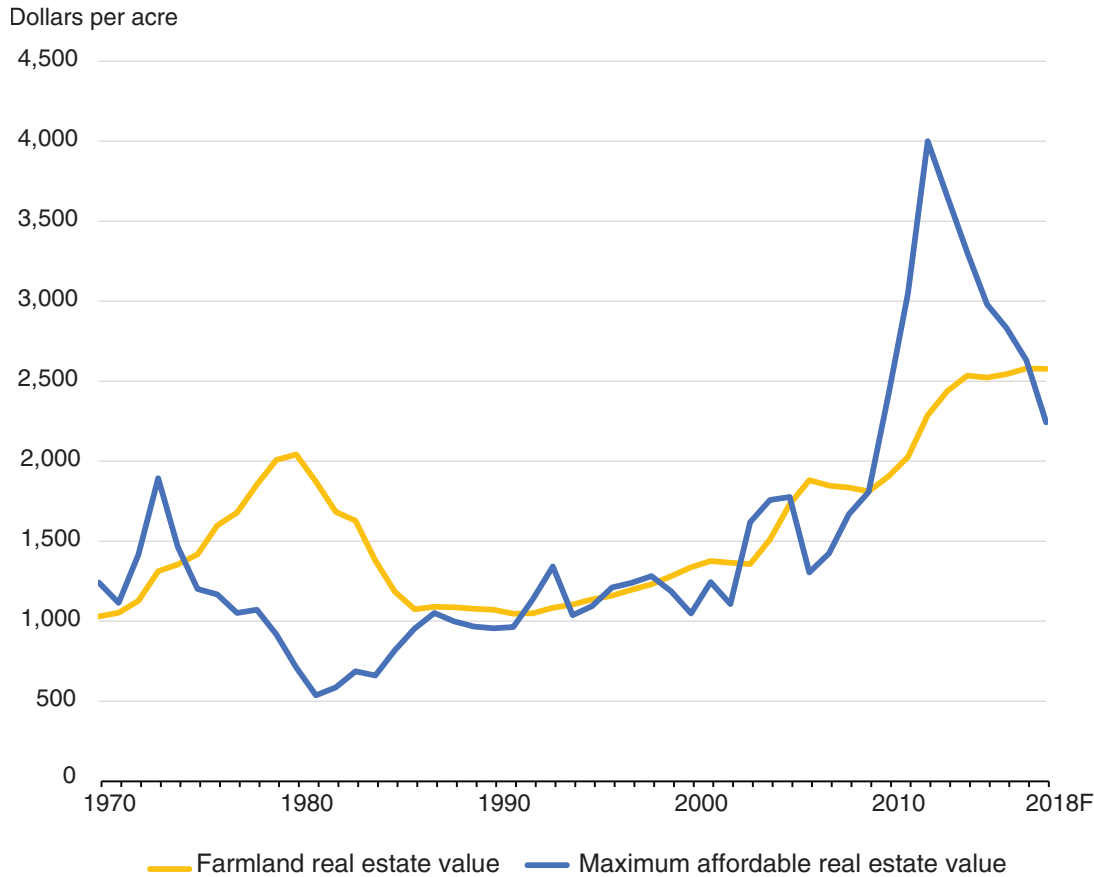
for strong farm income in the future, whereas falling values can reflect a more pessimistic outlook. Additionally, real estate is a source of collateral for lenders. Total U.S. farm real estate debt (debt secured by farmland and buildings) was forecast to total \$251 billion in 2018, representing more than 61 percent of total farm debt (USDA, ERS, 2019). Falling real estate prices can be particularly problematic for heavily indebted farmers as low prices make it more difficult for farmers to obtain new credit or to restructure existing loans.

Controlling for inflation, farm real estate values began to increase steadily after 1993 (fig. 4). Beginning around 2004, high net farm income and low interest rates led to faster appreciation of farmland values. In real terms, the average value of U.S. farm real estate nearly doubled between 2003 and 2014, from \$1,358 per acre to \$2,535 per acre. Since 2014, real estate prices have plateaued nationally and have even fallen in some regions (see Burns et al., 2018, for further discussion).

One way to gain insight into the direction of future real estate values is to determine the maximum price that farmers could pay for farm real estate based on their net farm income and current interest rates.³ If farm income is high and farmers can afford to pay more for land than the current market

³To determine the maximum price per acre for real estate that can be paid for from the adjusted net returns per acre, we assume a loan term of 30 years and use average annual mortgage rates for this type of loan. The amount of cash available to service debt on the purchase of all land and buildings is calculated as per acre revenues from all crops and livestock produced, Government payments, insurance indemnities, and cooperative dividends less operating and ownership expenses (i.e., adjusted net returns).

Figure 4
In 2018, forecasted earnings do not support farm real estate values



Note: F = forecast. The figure shows the value of farmland real estate (land and buildings on the land) and the estimated maximum value of farmland real estate that could be purchased based on adjusted net farm returns and in current interest rates, assuming a loan term of 30 years. All values expressed in 2018 dollars deflated using the U.S. Bureau of Economic Analysis chain-type gross domestic product deflator.

Source: USDA, Economic Research Service, Farm Income and Wealth Statistics. Data as of April 22, 2019.

price, then land prices will tend to be bid up. If farmers do not generate enough income to pay the current price for land, prices will tend to fall.

The relationship between the market value and the maximum affordable value of real estate since the 1970s is shown in figure 4. Except for two periods of major divergence, the market price of land has generally tracked the maximum affordable price. The first major divergence began in the mid-1970s when real estate prices increased rapidly, but rising interest rates caused the affordable price to drop. By 1980, the market value of real estate far exceeded what revenues could sustain and prices subsequently fell in inflation-adjusted terms. A second major divergence occurred from about 2011 to 2014 when high farm incomes and low interest rates meant farmers could afford to pay much more than the market price of real estate. As would be expected, the market price increased rapidly during this period.

By 2017, following the decline in farm income and the appreciation in real estate prices, the market price of real estate was approximately equal to what farmers could afford to pay. In 2018, the maximum affordable price is forecast to fall below the market price. This suggests there could be downward pressure on real estate prices at the national level.

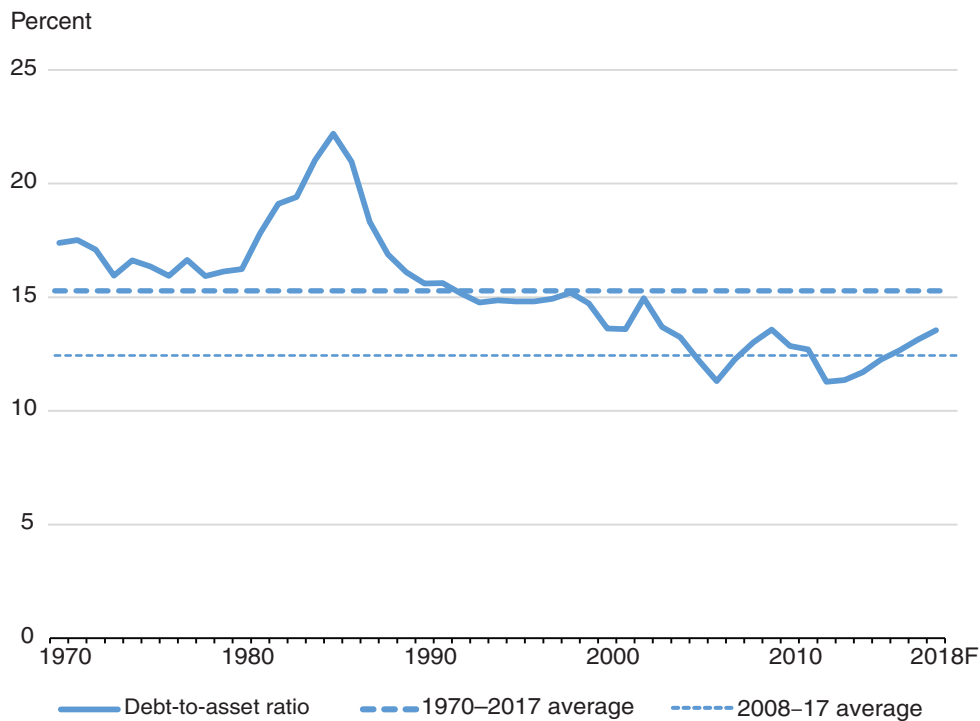
Debt-to-asset ratio

In the 1970s, farms borrowed heavily to expand production in response to rising commodity prices. Beginning in the early 1980s, higher interest rates, which raised borrowing costs, and lower commodity prices led to an increase in farm bankruptcies. Farm real estate, which accounts for over 80 percent of farm sector asset values, fell 50 percent in inflation-adjusted value between 1980 and 1987. The high levels of farm debt combined with falling land values caused the debt-to-asset ratio to spike during the mid-1980s (fig. 5).

The debt-to-asset ratio—total farm debt divided by total farm assets—is a measure of a farm business’s leverage and is used by lenders as an indicator of bankruptcy risk. Farms with a high debt-to-asset ratio are generally more highly leveraged and have less ability to cover potential financial liabilities through the sale of assets, leading to a greater risk of default. The high debt-to-asset ratio in the mid-1980s indicates increased farm financial stress.

Figure 5

Debt-to-asset ratio for farm sector remains below 1970-2017 average



Note: F = forecast.

Source: USDA, Economic Research Service, Farm Income and Wealth Statistics. Data as of April 22, 2019.

Recent decades have seen farm assets (especially farmland) appreciate more rapidly. From 1994 to 2012, farm sector assets increased by 98 percent, or 3.9 percent annually, driven by strong growth in land values (USDA, ERS, 2018a). In addition, since the 1980s farm crisis, regulatory authorities have tightened requirements for underwriting and agricultural lenders have embraced more conservative lending policies, resulting in lower loan-to-value ratios (Zhang and Tidgren, 2018). As a result, the farm sector’s debt-to-asset ratio has fallen since the mid-1980s and reached a historic low in 2012. Since then, the market for land has weakened and the debt-to-asset ratio has trended upward. The debt-to-asset ratio is now above its 10-year average, though it remains low by historic standards. In 2018, the debt-to-asset ratio was forecast to be 13.6, compared to the 1970-2017 average of 15.3.

Farm-Level Indicators of Financial Conditions

Sectoral indicators of financial health provide useful measures of the state of the agricultural economy, but these aggregate statistics can mask substantial variation at the farm level. In this section, we examine trends in the financial health of various types of farms using farm-level data from USDA's annual Agricultural Resource Management Survey (ARMS). A limitation with ARMS data is that they are only available since 1996. However, with more than 20 years of data available, it is possible to gain a useful historical perspective.

We measure three aspects of a farm's financial health: repayment capacity, liquidity, and solvency. Such measures are often used by lenders to assess the financial position and financial performance of farm operations. Farm financial measures were standardized and became more widely used by lenders following the 1980s farm crisis (FFSC, 2014). The measures provide a way for creditors to reduce the risk that a borrower will fail to repay the loan principal and interest payments. In general, 85-95 percent of farms in each subsector are not at financial risk across all three measures. However, as described below, the percent that are at risk is increasing.

Repayment capacity

Repayment capacity refers to the ability of a borrower to repay debt with farm and off-farm income. To measure repayment capacity, we use the term debt coverage ratio (TDCR), which is the capital debt repayment capacity divided by the total principal and interest on term debt (debt that has a set payment schedule). The capital debt repayment capacity is the income that a household has available to pay its debt, which includes the net farm income from the operation plus nonfarm income minus household living expenses plus interest on term debt.⁴ A larger ratio indicates a bigger margin to cover loan payments. A ratio less than one indicates the farm household does not have sufficient income to meet its loan payments.

Because the repayment capacity accounts for off-farm income, it provides a different perspective on farm financial health than the measures of liquidity or solvency. When prices or yields are low, a farm household may not earn sufficient income from the farm to meet its loan obligations, so the household may have to rely on off-farm income sources. Even in relatively good years, many small-scale operators rely on off-farm income to pay their debts. Such small-scale producers might have relatively little working capital or have a high debt-to-asset ratio but still earn enough off-farm to comfortably make their loan payments. For such farms, the measures of liquidity and solvency could overstate the risks of loan default or bankruptcy.

Figure 6 shows how the TDCR has evolved for farms in three size categories: small farms with annual gross cash farm income (GCFI) less than \$100,000, medium farms with annual GCFI between \$100,000 and \$500,000, and large farms with annual GCFI greater than \$500,000.⁵ The figure shows the percent of farms in each category that are in the “red zone”—defined by having a TDCR less than one.⁶

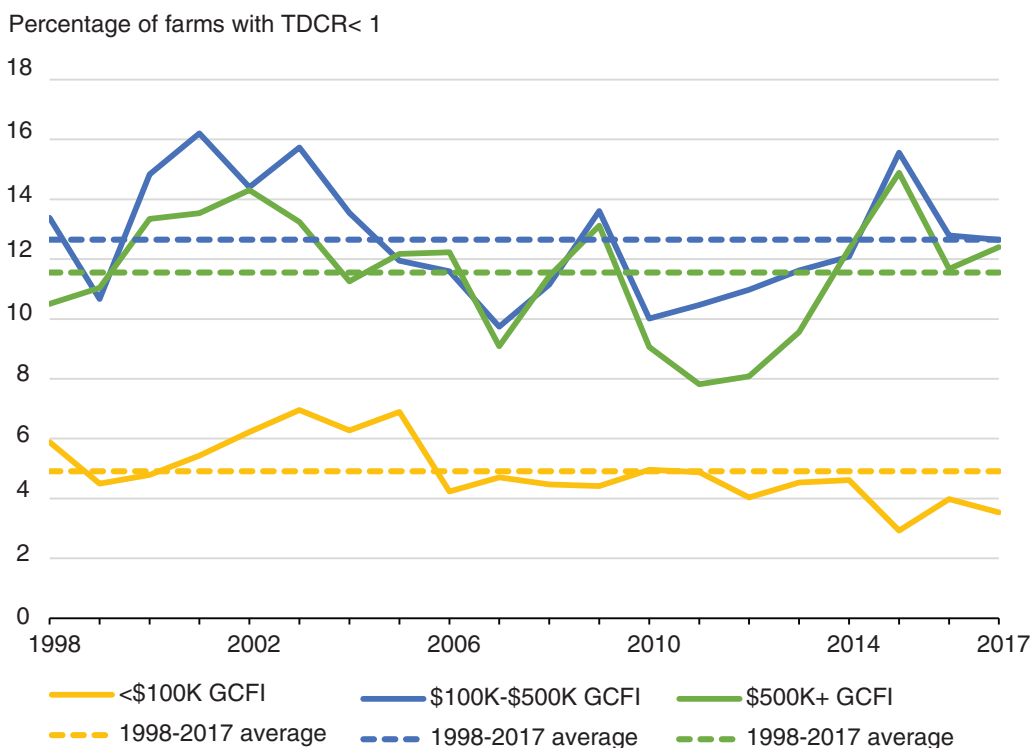
⁴Interest is not included in net farm income, so it must be added back into the numerator to measure the income available to make loan payments. The Farm Financial Standards Council recommends that income tax expenditures be subtracted from income in the numerator (FFSC, 2014). However, these expenses are not observed in ARMS so they are not subtracted. The TDCR would be lower if tax expenditures were subtracted from income.

⁵Farm size categories are adjusted for inflation. All values are in 2018 dollars.

⁶Throughout the report, the term “red zone” is used when a financial indicator is at a level that would indicate greater financial stress and a higher risk of loan default.

Figure 6

Between 2012 and 2017, the share of large farms with very low repayment capacity increased more than 4 percentage points



Note: The figure shows the share of farms in each gross cash farm income (GCFI) category in the “red zone” (a term debt coverage ratio (TDCR) less than one).

Source: USDA, Economic Research Service using data from USDA’s 1998-2017 Agricultural Resource Management Survey.

Over the last 20 years, the shares of medium and large farms in the repayment capacity red zone have exceeded the share of small farms in that zone.⁷ On average, households that operate small farms earn most of their income off the farm and have relatively little farm debt.

In the years following the peak in net cash farm income in 2012, the share of medium and large farms in the red zone increased. The increase was particularly steep for large farms—from 8.1 percent in 2012 to 12.4 percent in 2017. In contrast, small farms have remained largely insulated from the downturn in the agricultural economy. Indeed, the share of small farms in the red zone fell slightly over this period. The improving position for small farms is likely attributable to the strengthening nonagricultural economy over this period, since small farm households rely relatively more on off-farm income. So as the farm economy worsened and the nonfarm economy improved, small farms saw a relatively small increase in farm debt (because they have smaller farms) and a relatively large increase in household income (because they earn a larger share of their income from nonfarm sources).

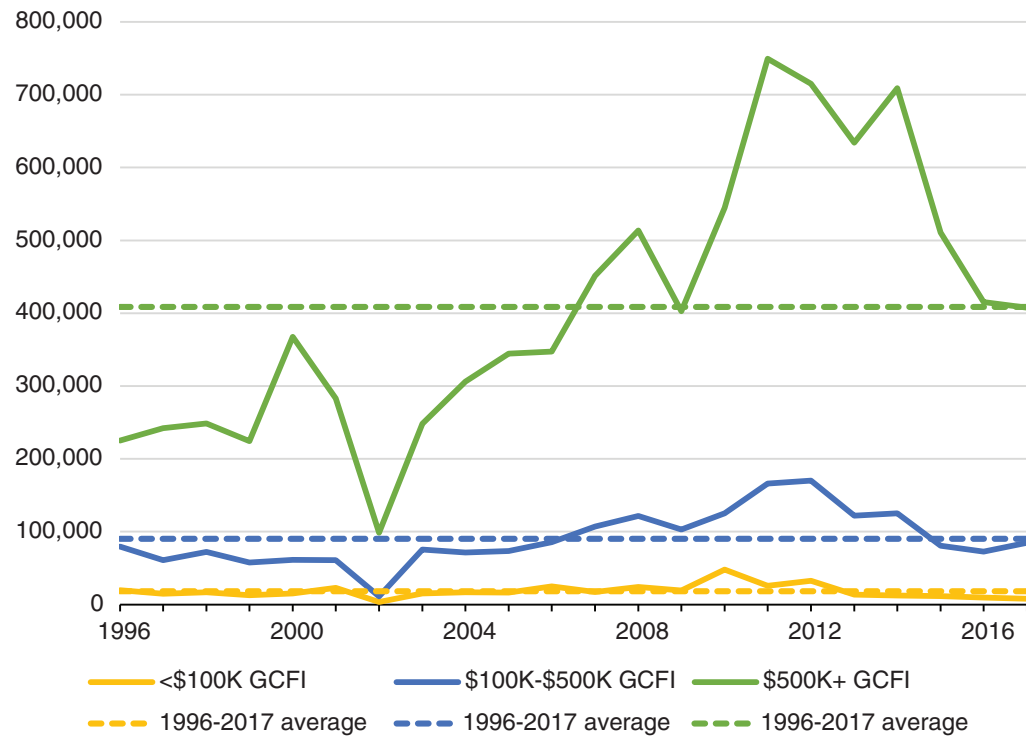
The shares of medium and large farms in the red zone are now slightly above their respective 1998-2017 averages. For these farms, however, the repayment capacity is currently stronger than it was in 2002—the year with the lowest aggregate net cash farm income since 1996. Specifically, the 2017 shares of medium and large farms in the red zone are about 2 percentage points below the 2002 shares.

⁷Survey data from 1997 were not available to calculate the TDCR, so the trends are shown only since 1998.

Figure 7

Working capital is down for all farm sizes since 2012 but remains above 2002 levels

Dollars (2018)



Note: GCFI = gross cash farm income. All values expressed in 2018 dollars deflated using the U.S. Bureau of Economic Analysis chain-type gross domestic product deflator.

Source: USDA, Economic Research Service using data from USDA's 1996-2017 Agricultural Resource Management Survey.

Liquidity

Liquidity is another important aspect of a business's financial health. Liquidity is a business's capacity to meet its short-term obligations without disrupting its normal operations. It describes how well a farm business can cover current liabilities using current assets (a current liability is defined as one that is due within 1 year, and a current asset is one that can be easily converted into cash within 1 year). Farmers face a number of recurring business costs, including input expenses, rents, and debt obligations. Current assets that can be quickly liquidated to pay for these recurring costs include savings in banks, certain types of livestock, and stored crops. Farm businesses require liquidity to be able to cope with a bad harvest or low commodity prices. Farmers without sufficient liquidity may be forced to sell noncurrent assets, such as real estate or farm equipment, or may have to take out new loans.

Working capital (current farm assets minus current farm liabilities) is a commonly used measure of liquidity that is related to the size of a farm business—larger operations generally require more working capital than smaller operations. In low-income years, farmers may draw down their working capital to pay their normal business expenses. In high-income years, working capital may be accumulated. This relationship is shown in figure 7 for the three farm sizes.

Since 2012, working capital for farms of all sizes has fallen as farmers have depleted their savings and inventory to cope with lower revenues. Small, mid-sized, and large farm operations have seen their working capital fall by 75 percent, 50 percent, and 43 percent, respectively. Despite these large declines, working capital remains close to long-run average levels for mid-sized and large farms and substantially above 2002 levels. For small farms, working capital is about half the long-run average

but about double the 2002 level. Because off-farm income accounts for most household income for small-scale farmers, a low level of working capital is less indicative of imminent financial stress for these farm households.

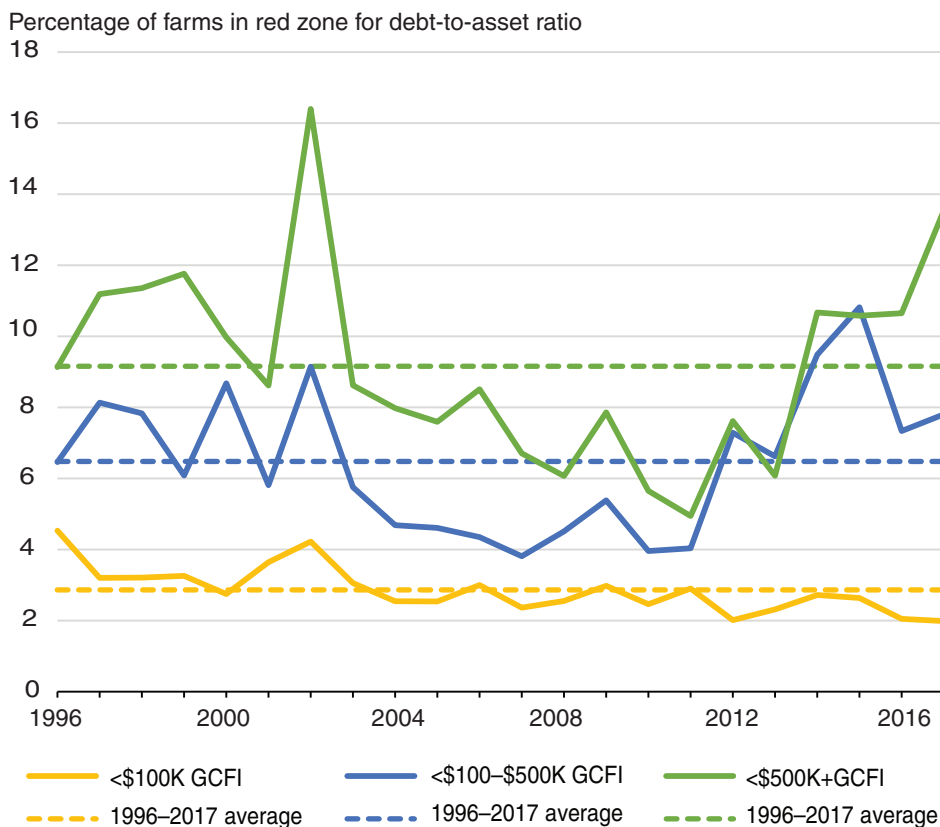
Solvency

The third indicator of financial health we consider is solvency, which is the ability of an operation to meet its long-term financial obligations and remain in business. As discussed earlier, the debt-to-asset ratio is a commonly used measure of solvency that indicates a business’s ability to cover its financial liabilities through the sale of assets.

Figure 8 shows the share of operations in each farm size category that are in a solvency red zone—that is, a debt-to-asset ratio above 55 percent.⁸ Many farmers have to borrow to expand their scale of production, and, consequently, larger farms tend to have a higher debt-to-asset ratio than smaller farms. This relationship with scale extends to the share of farms in the debt-to-asset red zone: from 1996 to 2016, an average of 9.2 percent of large farms were in the red zone, compared to 6.5 percent of mid-sized farms and 2.9 percent of small farms.

Figure 8

The share of large farms with high debt-to-asset ratio increased 6 percentage points since 2012



Note: The figure shows the share of farms in each gross cash farm income (GCFI) category with a debt-to-asset ratio greater than 55 percent.

Source: USDA, Economic Research Service using data from USDA’s 1996-2017 Agricultural Resource Management Survey.

⁸Following Kohl and Wilson (1997) and Ahrendsen and Katchova (2012), we use the level of 55 percent as the critical debt-to-asset threshold, though other higher or lower values may be used by lenders in practice.

Since 2012, the shares of mid-sized and large farms in the red zone have increased and are now above their respective 1996-2017 averages. In contrast, in 2017, the share of small farms in the red zone is essentially the same as it was in 2012. Large farms saw the largest increase in farms in the red zone between 2012 and 2017, with the share rising from 7.6 to 13.5 percent. While the red zone share for mid-sized and large farms has increased substantially in recent years, the current share remains below the peak levels reached in 2002.

Extreme financial stress

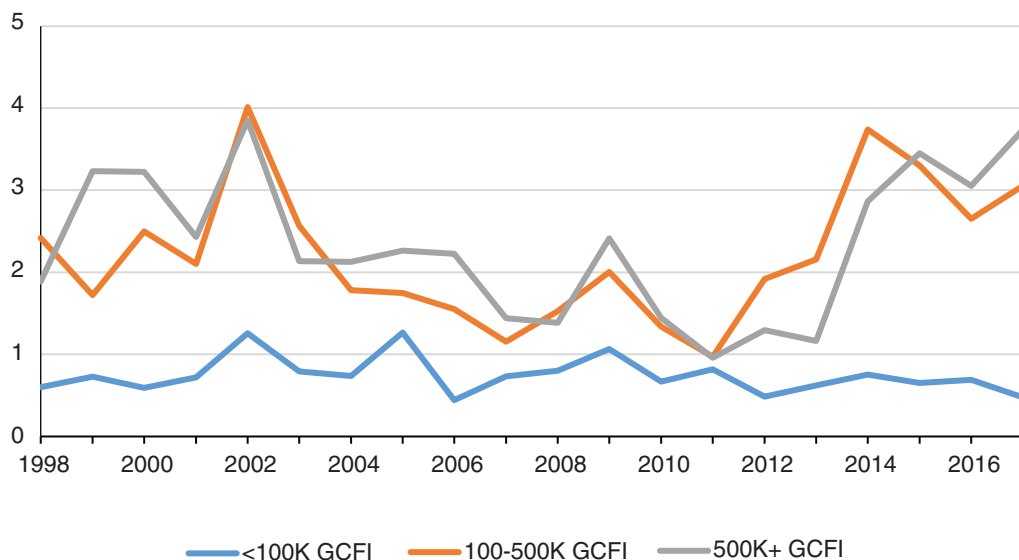
Finally, we use an indicator of financial stress that combines both the repayment capacity and solvency. Farmers who are in a red zone for both of these measures (a TDCR less than one *and* a debt-to-asset ratio greater than 55 percent) can be considered in “extreme financial stress.” Such farmers would not have enough household income to meet their principal and interest payments and would be heavily leveraged and therefore unlikely to be able to obtain new loans.

The share of farms in extreme financial stress follows a similar pattern as the share in the debt-to-asset red zone, except the levels are lower (fig. 9). In 2017, 3.7 percent of large farms were in extreme financial stress, compared to 3.0 percent of mid-sized farms and 0.5 percent of small farms. Between 2012 and 2017, the share of farms in extreme financial stress increased by 2.4 percentage points for large farms and 1.1 percentage points for mid-sized farms. Over the same period, the share of small farms in extreme financial stress was essentially unchanged. In 2017, the share of farms in extreme financial stress was at or below the peak levels in 2002 for all three farm sizes.

Figure 9

Between 2012 and 2017, the share of farms in extreme financial stress increased the most for large farms

Percentage of farms in extreme financial stress



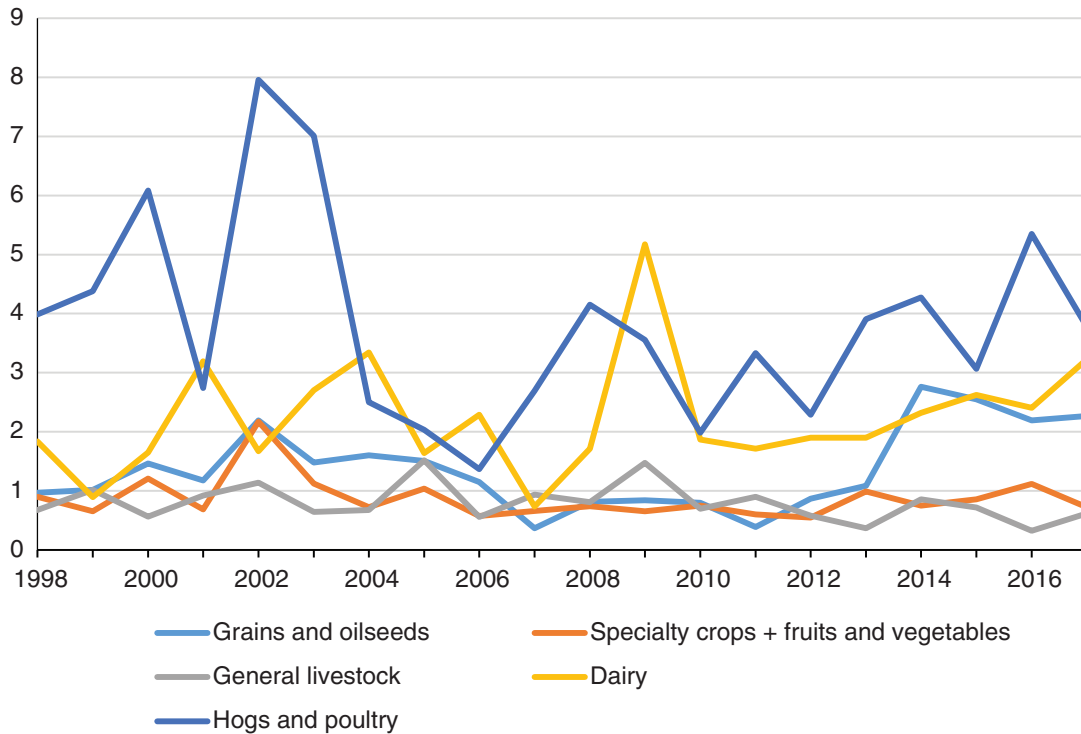
Note: The figure shows the share of farms in each gross cash farm income (GCFI) category in “extreme financial stress,” which is defined as having a term debt coverage ratio less than one and a debt-to-asset ratio greater than 55 percent.
Source: USDA, Economic Research Service using data from USDA’s 1998-2017 Agricultural Resource Management Survey.

Further insight into how financial stress is distributed across farms of different types can be gained by disaggregating the farm-level data by commodity specialization (fig. 10). We define a farm as specializing in a particular commodity group if that commodity or group of commodities makes up at least 50 percent of the farm’s total value of production in a given year. To focus on the influence of commodity specialization rather than farm size, we restrict figure 10 to farms with at least \$500,000 in annual sales.

Figure 10

The share of farms in extreme financial stress is highest for hog and poultry operations

Percentage of farms in extreme financial stress



Note: Statistics computed only for farms earning at least \$500,000 in annual gross cash farm income. The figure shows the share of farms in each crop specialization category in “extreme financial stress,” which is defined as having a term debt coverage ratio less than one and a debt-to-asset ratio greater than 55 percent.

Source: USDA, Economic Research Service using data from USDA’s 1998-2017 Agricultural Resource Management Survey.

In 2017, among the commodity categories considered, large-scale poultry and hog farms and dairy operations had the greatest share of farms that were financial vulnerable—with about 3-4 percent being in extreme financial stress. It is possible that the large investment in facilities required by poultry, hog, and dairy farms causes these operations to have a relatively higher debt-to-asset ratio than other commodity-type operations, making them more financially vulnerable. Among large-scale general livestock and specialty crop, fruit, nut, and vegetable producers, less than 1 percent of farms were in extreme financial stress. Large-scale grain and oilseed producers fell in between these two shares, with a little more than 2 percent of farms being in the red zone.

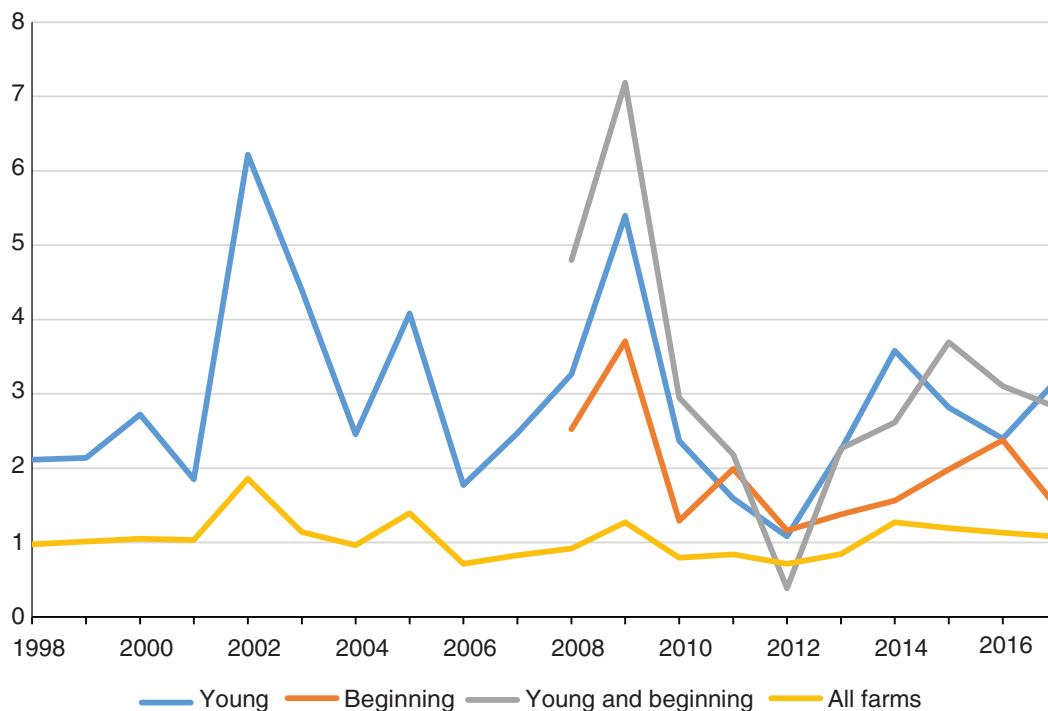
Reflecting falling farm income, the share of producers in the red zone increased about 1.5 percentage points between 2012 and 2017 for grain and oilseed farms, poultry and hog producers, and dairy farms. The other specializations had a low share of farms in extreme financial stress in 2012, and the share remained essentially unchanged in 2017. There was little change in part because these specializations are dominated by smaller farms, which were more resilient to the farm income decline.

Figure 11 shows the share of farms in extreme financial stress broken out by operator age and farming experience (information on beginning farmers is only available since 2007). Farms with young operators (less than 40 years old) and beginning operators tend to be smaller in scale. Despite this, the shares of young-operator farms (3.0 percent) and beginning-operator farms (1.5 percent) in extreme financial stress in 2017 are larger than the share of all U.S. farms (1.0 percent). The higher share of young and less experienced farmers in extreme financial stress may be attributed to the tendency of farmers to expand their farm size rapidly when they are young (Key and Roberts, 2007; Katchova and Ahearn, 2015). This implies that farmers invest more in growing their business when they are younger and are starting their operations, and then they reduce their rate of investment in land and machinery as they age. At the same time, younger beginning farmers have had less time to build equity through savings, resulting in higher debt-to-asset ratios.

Figure 11

The share of farms in extreme financial stress was higher in 2017 than in 2012 for farms with young principal operators

Percentage of farms in extreme financial stress



Note: Data on beginning farms are not available before 2007. A “beginning farm” is one in which all farm operators have 10 years or less farming experience on any operation. A “young farm” is one in which the principal operator is less than age 40. A farm is considered to be in “extreme financial stress” if it has a term debt coverage ratio less than one and a debt-to-asset ratio greater than 55 percent.

Source: USDA, Economic Research Service using data from USDA’s 1998-2017 Agricultural Resource Management Survey.

Since 2012, the shares of all farms and all beginning farms in extreme financial stress have increased by less than half a percentage point. This reflects the fact that large portions of all farms and beginning farms are small-scale, and the share of small farms in extreme financial stress has not changed appreciably since 2012 (see fig. 9). Among farms with young operators and beginning farms with young operators, the share in extreme financial stress between 2012 and 2017 increased by 2.0 to 2.5 percentage points. However, the share of farms with young operators in the red zone was lower in 2017 than it was in 2002 (we cannot make a similar comparison for beginning farms because the data on farming experience do not go back to 2002).

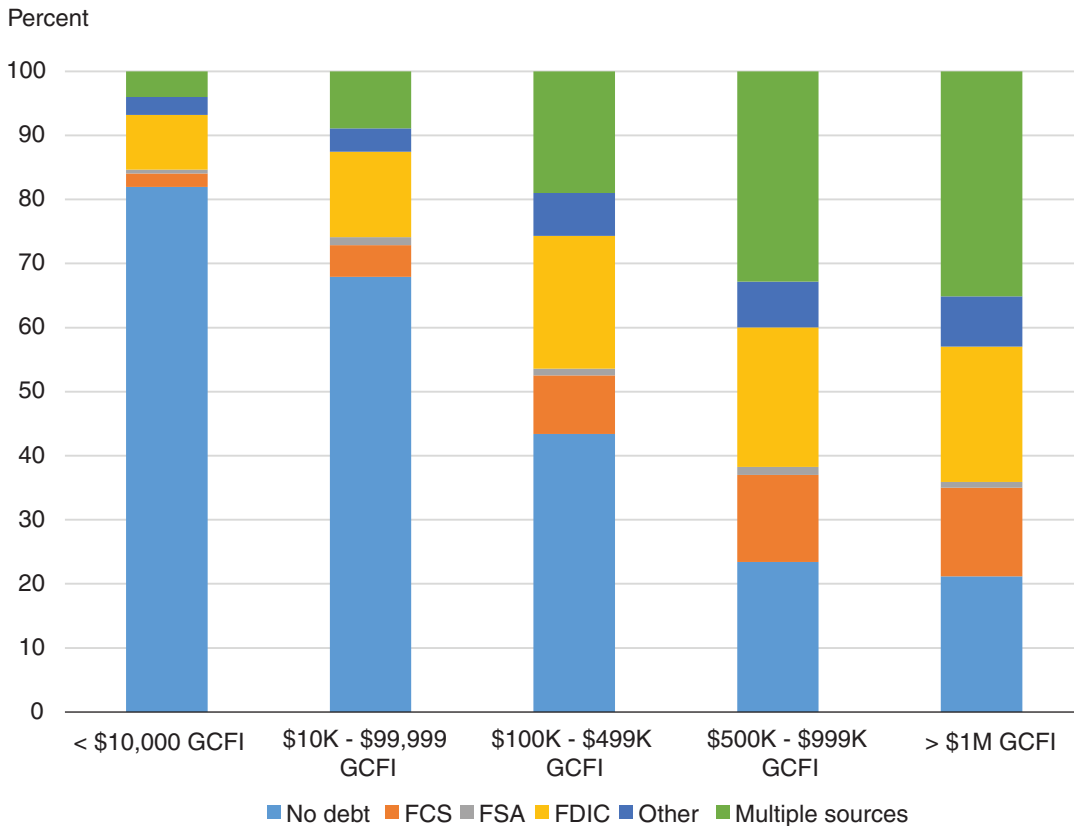
Agricultural Loan Performance

Information on agricultural loan delinquencies provides another perspective on the health of the agricultural economy. Farmers may fall into loan delinquency if they experience unexpected short-falls in farm or nonfarm income and lack sufficient working capital or are unable or unwilling to liquidate other assets to meet their payments. An increase in the delinquency rate indicates an increase in the number of farmers that are in financial stress.

According to ARMS data, in 2017, 68 percent of farmers had no debt, 22 percent borrowed from a single lender, and 10 percent borrowed from at least two different lenders. About 47 percent of farmers' loan volume originated from commercial banks; 31 percent came from the Farm Credit System (FCS), which is a network of borrower-owned cooperative lending institutions; and 4 percent came from USDA's Farm Service Agency (FSA), which operates a number of farm loan programs, some of which target particular groups, like beginning farmers or racial and ethnic minorities. About 19 percent of farmers borrowed from another source, including State and county governments, savings and loan associations, life insurance companies, implement dealers, input suppliers, co-ops, credit cards, Farmer Mac, credit unions, and other individuals or institutions.

Figure 12

Larger farms are more likely to have debt than farms of other sizes, 2017



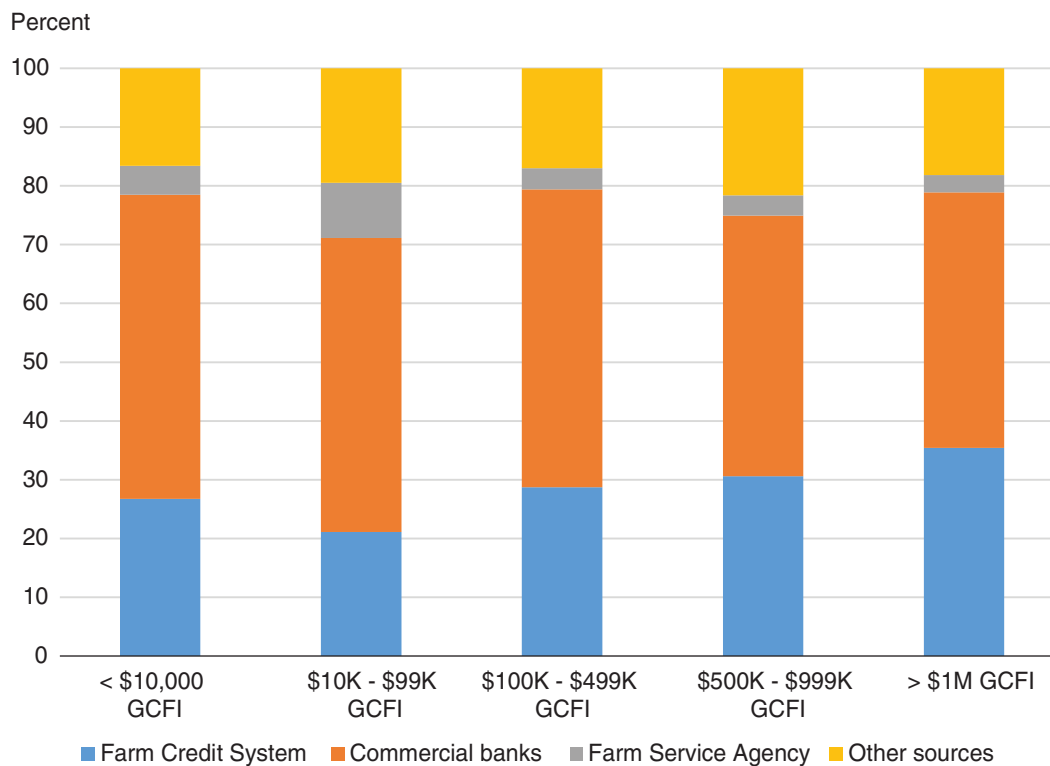
Note: The chart shows the share of farms in each gross cash farm income (GCFI) category receiving loans from each source, from multiple sources, or who have no debt. FCS = Farm Credit System. FSA = USDA, Farm Service Agency, FDIC = Federal Deposit Insurance Corporation.

Source: USDA, Economic Research Service using data from USDA's 2017 Agricultural Resource Management Survey.

Breaking out the sources of debt by farm sales category shows how borrowing patterns change with farm size (fig. 12). Larger farm operations are much more likely to borrow than farms of other sizes: only 21 percent of farms with at least \$1 million in annual sales had no debt, compared to 82 percent of farms with less than \$10,000 in annual sales. Larger farms are also more likely to borrow from multiple sources: 35 percent of farms with at least \$1 million in annual sales borrowed from multiple lenders, compared to only 4 percent of farms with less than \$10,000 in annual sales. Larger farms might be more likely to borrow from multiple sources than other farms because they have more diverse loan needs (land, operating credit, equipment, livestock purchases, etc.).

The share of farms that borrowed from different lenders also varies with farm size (fig. 13). Large farms receive a greater share of their debt from the FCS than farms of other sizes. For example, for farms with at least \$1 million in annual gross cash farm income (GCFI), 35 percent of debt originates at FCS, compared to only 27 percent for farms with less than \$10,000 in annual GCFI. Large farms are also less likely than other farms to borrow from commercial banks: farms with at least \$1 million in annual GCFI obtain 44 percent of their debt from commercial banks, compared to 52 percent for farms with less than \$10,000 in annual GCFI. Smaller farms—particularly those with between \$10,000 and \$99,999 in annual GCFI—obtain more of their credit from FSA, reflecting the agency’s objectives of targeting beginning farmers and other types of farmers that tend to operate at a smaller scale.

Figure 13
Larger farms obtain a relatively large share of their debt from the Farm Credit System, 2017

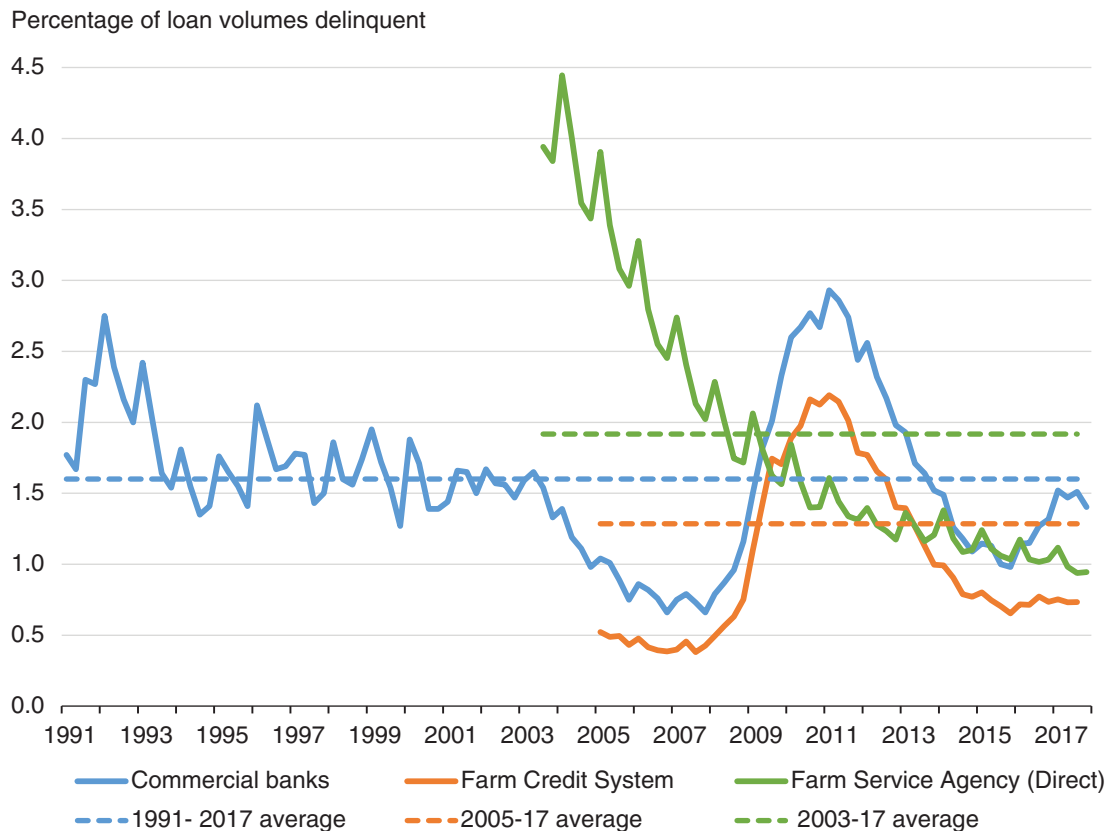


Note: The chart shows, for each gross cash farm income (GCFI) category, the percent borrowed from each credit source. Source: USDA, Economic Research Service using data from USDA’s 2017 Agricultural Resource Management Survey.

Loan delinquency rates expressed as a percent of total loan volume are available for FCS, FSA, and commercial bank loans. For commercial banks and the FCS, a loan is considered to be delinquent when payment is past due for a period of 90 days or more or when it has entered nonaccrual

status (interest is overdue). FCS call report includes data on the performance of farm mortgage and production loans for all Farm Credit Banks and direct lending associations since 2005 (Farm Credit Administration, 2018). The commercial bank data were collected from call report data (financial information that lenders report to regulators) downloaded from the Federal Reserve Bank of Chicago and Federal Financial Institutions Examination Council (FFIEC) (Federal Reserve Bank of Chicago, 2018; FFIEC, 2018).⁹ The FSA data, collected from the Monthly Management Reports, include information on direct loan volumes, or loans funded and serviced by the agency, and not guaranteed loans through commercial lenders (USDA, FSA, 2018). An FSA loan is considered to be delinquent when a borrower has failed to make scheduled payments by the due date. For all sources, loans are split into two categories: real estate (loans secured by real estate) and production (other loans for farm purposes).

Figure 14
Agricultural real estate loan delinquency rates have fallen since 2012



Source: USDA, Economic Research Service using commercial bank data from Federal Reserve Bank of Chicago (Federal Reserve Bank of Chicago, 2018); Farm Credit System (FCS) data for the 69 associations and 4 banks within the FCS (FCS, 2018); and USDA, Farm Service Agency data for direct loans only (USDA, FSA, 2018).

For agricultural real estate loan delinquency rates, data are available for commercial bank loans since 1991, for FCS loans since 2005, and for FSA direct loans since 2003. Delinquency rates for both commercial bank loans and FCS loans increased precipitously starting in 2008, rising by about 2.0 to 2.5 percentage points between 2008 and 2011 (fig. 14). The increases in loan delinquency correspond with the onset of the housing crisis and the Great Recession. The timing implies that the nonfarm economy, including declines in nonfarm real estate values, factored into the ability of

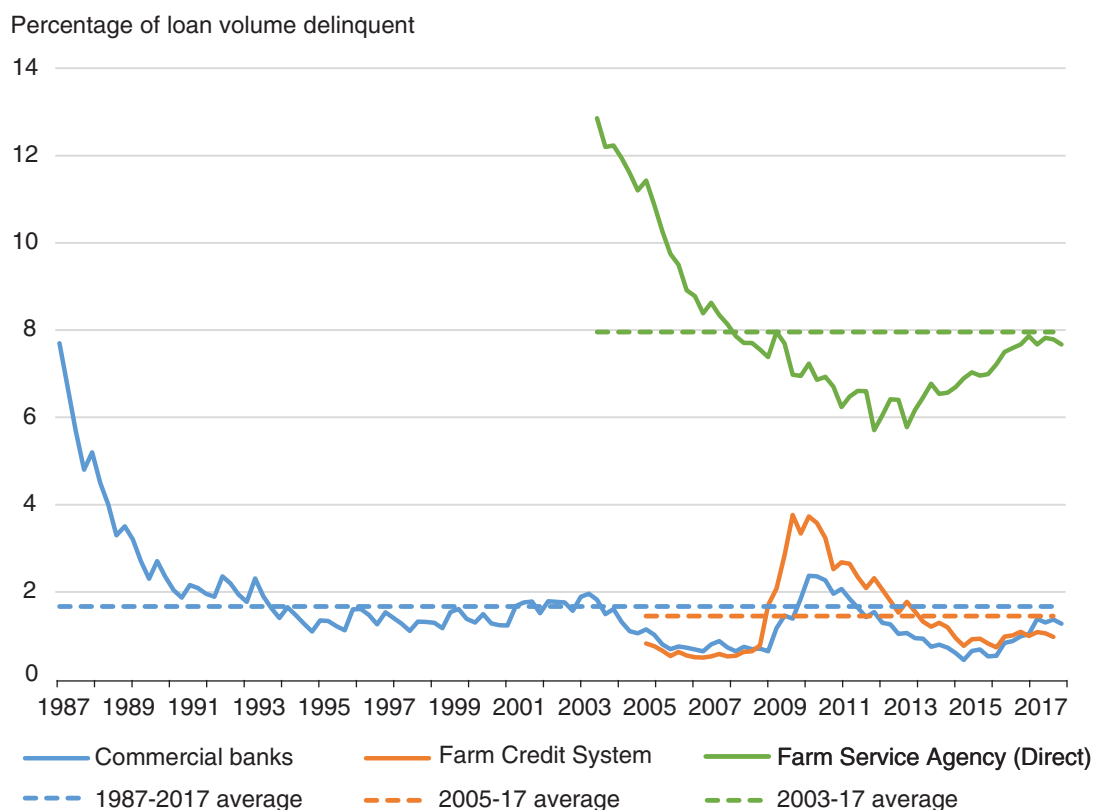
⁹For the delinquency rate analyses, “commercial banks” include Federal Deposit Insurance Corporation (FDIC)-insured banks under commercial or savings bank charters.

farmers to repay their loans (Briggeman, 2011). Off-farm income accounts for almost 80 percent of all income that flows to family farm households (Burns and MacDonald, 2018). Reductions in off-farm income following the onset of the recession may have made it more difficult for some farmers to meet their loan obligations. Beginning in 2011, delinquency rates for commercial bank and FCS loans declined (though rates for commercial bank loans began rising again in 2016), and by the end of 2017, they were below average levels for the periods for which data are available.

The FSA’s direct loan programs target socially disadvantaged farmers, beginning farmers, veterans, and farmers who are unable to find credit elsewhere, resulting in delinquency rates that historically have been higher than those of the other two institutional lenders.¹⁰ Delinquency rates for FSA direct loans declined over the period for which we have data. The default rate fell as the FSA increasingly targeted beginning farmers in response to changes in legislation. Over much of the study period, beginning farmers have had substantially lower default rates than other FSA direct loan borrowers (USDA, FSA, 2018). Beginning farmer default rates might be lower because they operate, on average, smaller farms and earn relatively more nonfarm income than nonbeginning farmers.

Figure 15

Agricultural production loan delinquency rates are below long-run averages



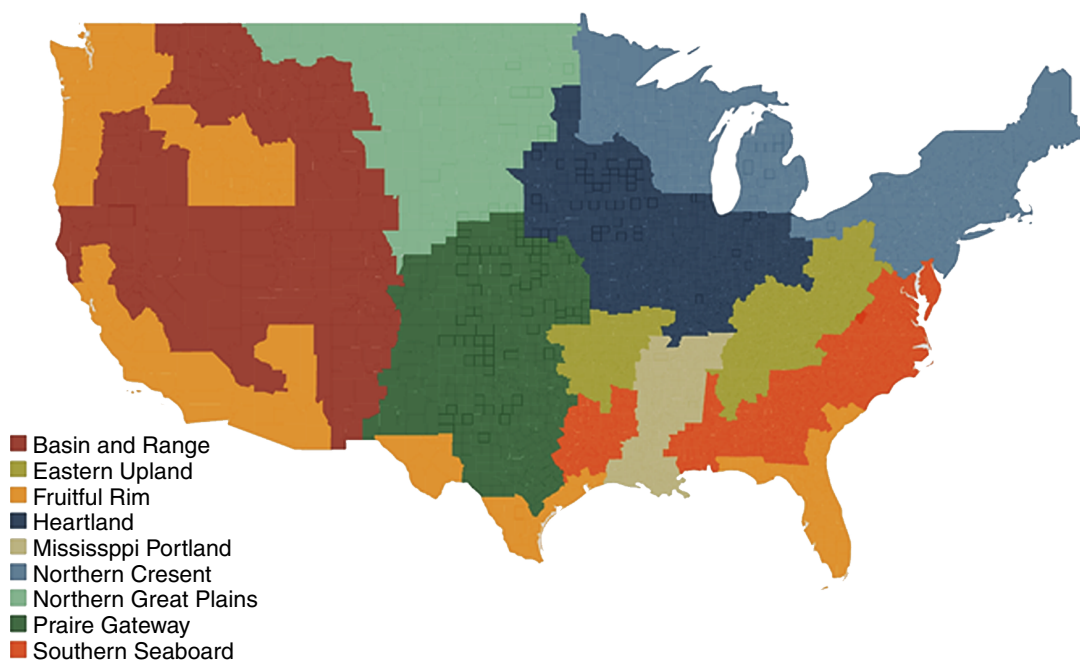
Source: USDA, Economic Research Service using commercial bank data from Federal Reserve Bank of Chicago (Federal Reserve, 2018); Farm Credit System (FCS) data for the 69 associations and 4 banks within the FCS (FCS, 2018); and USDA, Farm Service Agency data for direct loans only (FSA, 2018).

¹⁰Delinquency rates for FSA are not directly comparable to those for FCS because, as noted earlier, the respective definitions of delinquency differ (30 days for FSA and commercial banks versus 90 days for FCS). If FCS used a 30-day delinquency definition, its rates would be higher.

Production or operating loans tend to be of shorter duration than real estate loans. Production loans can be used to purchase livestock, farm equipment, or farm operating expenses (feed, seed, fertilizer, pesticide, rent, etc.). Data on delinquency rates for production loans extend back to 1987 for commercial banks. Delinquency rates were very high in the late 1980s in the wake of the 1980s farm crisis (fig. 15). Between 1987 and 1990, delinquency rates fell from almost 8 percent to about 2 percent. In the past decade, delinquency rates on production loans from commercial banks and FCS loans exhibited a similar pattern to real estate loans—with rates starting to increase in 2008, peaking in 2011, and then falling back below average levels. The pattern corresponds to the onset of the Great Recession and the subsequent economic recovery—that is, sharp falls in the rates of nonfarm employment and declines in nonfarm asset values, followed by a gradual return to pre-recession levels.

As with real estate loans, the FSA delinquency rates on direct production loans did not increase in response to the Great Recession. In fact, delinquency rates fell from 2003 to 2012. The delinquency rates on FSA production loans have increased gradually since 2012, as agricultural incomes fell, but rates remain below the 2003-17 average.

Figure 16
ERS Farm Resource Regions



Source: USDA, Economic Research Service using Heimlich (2000).

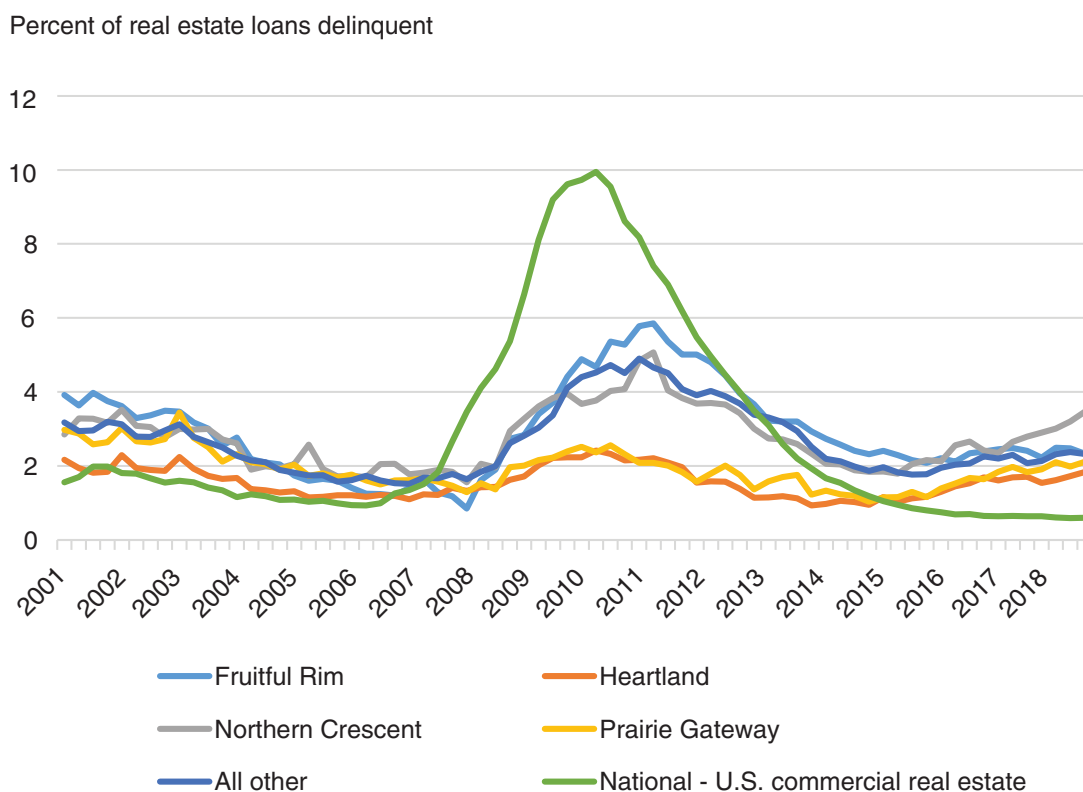
Aggregate national statistics on delinquency rates can mask variation at local or regional levels. To examine regional trends in delinquency rates, we disaggregated commercial bank loan volumes across counties by combining call report data from the FFIEC with regulatory information contained in the Summary of Deposits Survey and the Community Reinvestment Act evaluations (see appendix for details about the regional disaggregation). The regulatory data provide information on individual lender loan volumes at the county level and aggregate delinquency volumes at the lender level. Delinquent volumes were distributed to counties in proportion to the percent of each

institution’s loan volume in each county. Regional delinquency rates were then calculated by aggregating these volumes for each ERS production region.¹¹

For graphical clarity, delinquency rates are estimated for the four ERS Farm Resource Regions containing the largest shares of total debt according to 2017 ARMS data, with the remaining five regions aggregated. The four regions examined—Fruitful Rim, Heartland, Northern Crescent, and Prairie Gateway—are the largest in terms of production value, and together represent 60 percent of all farms and 72 percent of the value of agricultural production (fig. 16).

Real estate loan delinquency rates follow a similar pattern across regions in terms of when rates increase and decrease (fig. 17). However, the magnitude of the rate changes varies substantially across regions. Delinquency rates increased by about 3 and 4 percentage points in the Northern Crescent and Fruitful Rim, respectively, between 2008 and 2011, but increased by only about 1 percentage point in the Heartland and Prairie Gateway.

Figure 17
Prairie Gateway and Heartland have had lower real estate loan delinquency rates than other regions



Source: USDA, Economic Research Service using commercial bank data from Federal Reserve Bank of Chicago (Federal Reserve Bank of Chicago (2018)).

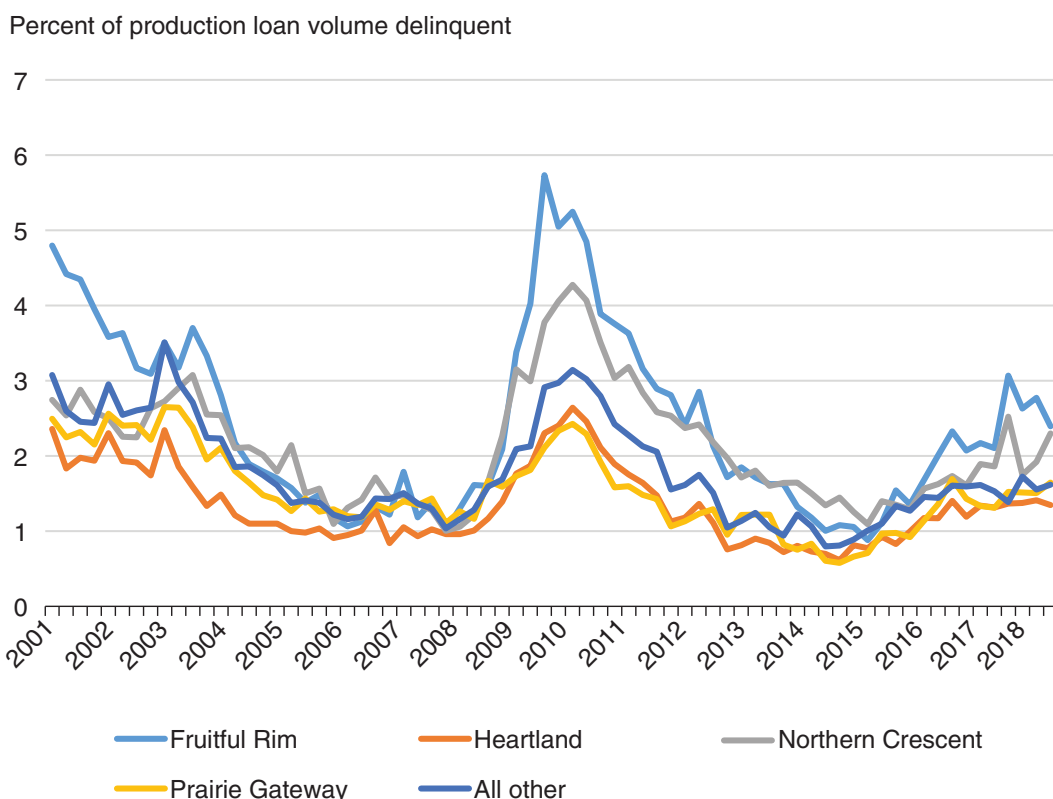
Differences in real estate loan delinquency rates across regions during 2008-11 appear to be driven in part by the relative exposure of each region to the broader economic downturn. Figure 17 displays the national delinquency rates for commercial real estate loans. The figure shows that delinquency rates of nonfarm commercial real estate loans began to increase before those of agricultural real

¹¹For the regional disaggregation, delinquency rates are calculated for loans that are 30 days or more past due as well as loans that are in nonaccrual status (a nonperforming loan that is not generating its stated interest rate because of nonpayment by the borrower).

estate loans, and the increase was greater. Farmland values may have faced more headwinds from the Great Recession and the housing crisis in regions with larger decreases in urban housing prices. It has been estimated that the premium associated with farmland that is located near a metro region fell from 40 to 20 percent during the downturn (Zhang and Nickerson, 2015). That is, the decline in metro real estate values during the recession exerted a downward force on nearby farmland values. Urban real estate depreciation would have disproportionately impacted regions with more urban areas and areas where metro real estate prices fell more. Higher delinquency rates in the Fruitful Rim and Northern Crescent are consistent with the higher percentage of counties classified as metropolitan than the Heartland or Prairie Gateway (U.S. Census Bureau, 2013). In addition, off-farm income (which can influence loan repayment capacity) may have fallen more in coastal regions than in the Midwest. Metro and suburban areas in the Fruitful Rim experienced greater increases in unemployment than metro regions in the Heartland (Garr, 2011).

Figure 18

Fruitful Rim has had a higher production loan delinquency rate than other regions



Source: USDA, Economic Research Service using commercial bank data from Federal Reserve Bank of Chicago (Federal Reserve Bank of Chicago, 2018).

Starting in 2015, real estate loan delinquency rates began to rise again in most regions while non-farm commercial real estate delinquency rates remained very low. As of the fourth quarter of 2018, the national delinquency rate for farmland was 2.3 percent. There was a spread of about 1.7 percentage points across regions: the highest delinquency rates were about 3.5 percent in the Northern Crescent and the lowest rates about 1.8 percent in the Heartland.

Production loans follow a similar trend over time to real estate loans, with the Northern Crescent and especially the Fruitful Rim experiencing larger increases in delinquency rates from 2008 to 2011 (fig. 18). These two regions also have the highest delinquency rates as of the second quarter

of 2018. As with real estate loans, delinquency rates for production loans were usually lower in the Heartland and Prairie Gateway. Differences across regions are likely explained in part by differences in average farm size and in commodity mixes—with some commodities experiencing more favorable changes in output and input prices relative to other commodities. As shown earlier, farmers specializing in certain commodities and operating larger farms are more likely than other farmers to experience extreme financial stress (see fig. 10).

Like the pattern exhibited by real estate loan delinquency rates, the increase in production loan delinquency rates starting in 2008 appears to be driven by exposure to the economic effects of the recession, while the more recent uptick in loan delinquency rates corresponds to the downturn in the agricultural economy. Since 2015, production loan delinquency rates have risen between 0.5 percent and 1.5 percent across all regions.

Which Farms Would Be Vulnerable If Farm Income Were To Fall?

If farm incomes fall in the years ahead, more farmers will find it difficult to meet their debt obligations. Repayment capacity will decline, and more farmers will draw down their working capital stock. Some farmers without sufficient working capital may be able to obtain new loans to finance their production expenses, or they may be able to restructure their loans to reduce their debt payments. However, some of those who are unable to borrow or restructure their debt may have to sell their land, equipment, or other farm assets. The most financially stressed farms may be forced to sell their operations or file for bankruptcy protection.

To identify the types of farms that could be the most vulnerable to a further decline in farm income, we estimate which farms in 2017 (the most recent year for which ARMS data are available) would be under “extreme financial stress” if there were a 10-percent or 20-percent decrease in gross cash farm income, holding everything else constant including input expenses.¹² To put these numbers in perspective, gross cash farm income declined 11.7 percent from 2012 to 2016. We define extreme financial stress as we did earlier—that is, being in both the repayment capacity and solvency red zones (a TDCR less than one and a debt-to-asset ratio greater than 55 percent).

Table 1

Large farms would see biggest increase in extreme financial stress if gross income falls

	Percent change in gross income from 2017 level		
	0	-10	-20
	<i>Percent of farms in extreme financial stress</i>		
All farms	1.1	1.3	1.6
GCFI category			
< \$100,000	0.5	0.5	0.6
\$100,000 – \$499,999	3.1	3.9	4.9
> \$500,000	3.7	5.2	6.7
Commodity specialization of farms			
Grains and oilseeds	2.3	3.0	4.0
Specialty crops, fruits, nuts, nursery	0.7	0.8	1.0
General livestock	0.6	0.7	0.7
Dairy	3.2	4.9	6.8
Hogs and poultry	3.8	5.0	5.9
Farm operator age and experience			
Young	3.2	4.4	5.4
Beginning	1.5	1.9	2.4
Young and beginning	2.8	4.0	5.3

Note: The table shows the percent of farms in each category that are in “extreme financial stress,” which is defined as having a term debt coverage ratio less than one and a debt-to-asset ratio greater than 55 percent. GCFI = gross farm cash income.

Source: USDA, Economic Research Service using data from USDA’s 2017 Agricultural Resource Management Survey.

¹²It is not possible to simulate a percentage decline in net farm income for individual farms because a large share of surveyed farms do not earn a positive net farm income in any year—that is, their costs exceed their revenues.

In 2017, only 1.1 percent of all farms were in extreme financial stress, according to our definition (table 1). However, the likelihood of being in extreme financial stress increases with farm size. Only 0.5 percent of small farms were in extreme stress in 2017, compared to 3.1 percent of midsize farms and 3.7 percent of large farms.

While a relatively similar share of midsize and large farms were in extreme financial stress in 2017, the share of farms in stress would increase more for large farms if farm revenue fell. For example, if gross revenue declined 20 percent, the share of large farms in stress would increase to 6.7 percent, compared with 4.9 percent for midsize farms and 0.6 percent for small farms. For midsize and large farms, the shares in this scenario would be the highest since at least 1998 (fig. 9). The disproportionate increase in financial stress for larger farms stems from the role of off-farm income: large farms have relatively less off-farm income than smaller sized farms with which to compensate for a downturn in farm income. Consequently, more large-scale producers are likely to have a term debt coverage ratio (TDCR) below one when their sales decline.

Farms would be affected differently by a decline in gross farm income depending on their commodity specialization. If gross income were to fall by 20 percent, the share of concentrated livestock farms (hog, poultry, and dairy operations) in extreme stress would increase between 2.1 and 3.6 percentage points. Dairy farms, which would see the biggest increase in the share of farms in extreme financial stress, tend to be relatively large-scale, capital intensive, and highly leveraged and, hence, more vulnerable to a decline in farm revenues.

If sales were to decline by 20 percent, the share of young and young-beginning farms in extreme financial stress would increase to 5.4 percent and 5.3 percent, respectively. The share of beginning farms in financial stress would increase to 2.4 percent.

In all the simulations, a decline in sales of 10 percent would result in increases in the share of farms in extreme financial stress that are approximately half as large as the percentage point increases resulting from a 20-percent decline in sales.

Conclusions

From 2012 to 2017, farm sector net cash income fell by a third after adjusting for inflation—the largest multiyear decline since the 1970s in percentage terms. With the drop in farm income, land price appreciation slowed considerably and inflation-adjusted real estate values fell in some regions. The economic downturn coincided with a change in direction in monetary policy, and higher interest rates made borrowing more expensive.

While U.S. agriculture is in a less prosperous and potentially vulnerable period, indicators of farm financial health suggest that, as of 2017, the economic downturn has not been as extreme as the farm crisis of the 1980s. Inflation-adjusted net farm income is down significantly from near record-high levels in 2012, yet income remains close to its 1970-2017 average. And even though farm sector debt is again near the record-high levels of the late 1970s and early 1980s, interest expenses have not increased proportionately because of low interest rates. In 2018, interest expenses were forecast to remain 7 percent below the 1970-2017 average levels. In addition, while farmland is no longer appreciating rapidly, asset values remain strong relative to debt levels. The debt-to-asset ratio for the sector is now above its 10-year average, but it is well below its 1970-2017 average.

While the farm sector as a whole does not appear to be in crisis, it is possible that sectoral indicators of financial health could mask substantial financial stress for some types of farms. Indeed, farm-level indicators of repayment capacity and leverage indicate that larger farms (those with at least \$100,000 in annual gross income) are more likely to be in financial risk than smaller farms. Since farm income peaked in 2012, the share of farms in financial stress increased the most for farms with at least \$500,000 in annual gross income. The share of small farms (with less than \$100,000 in annual gross income) in financial stress actually declined from 2012 to 2017. Even though the measures of financial stress for larger operations have worsened since 2012, the indicators of repayment capacity and leverage indicate that most (more than 85 percent) of these large farms are not in financial stress. The financial stress measures are currently near their 1996-2017 average levels and are lower than recent peak levels seen in 2002.

Larger farms may be more financially vulnerable than smaller farms because they derive a greater share of their income from the farm and earn less income off-farm. It is possible that when farm income goes down, operators of large farms are more likely to need to borrow more to meet their expenses—they cannot as readily cover their production losses with their off-farm income without borrowing.

In addition to larger operations, poultry and hog farms and dairy farms are more likely than farms specializing in other commodities to be in “extreme financial stress,” which is defined as not having enough household income to meet current loan payments (a term debt coverage ratio less than 1) and also being heavily leveraged (a debt-to-asset ratio greater than 55 percent). Farms with young or beginning operators were also more likely to be in extreme financial stress than an average farm. However, extreme financial stress is not common: less than 3 percent of young and beginning farmers were in extreme financial stress in 2017, compared to about 1 percent of all farms.

Recent increases in financial stress have begun to be reflected in farm loan delinquency rates. In particular, delinquency rates for both Farm Credit System (FCS) and commercial bank loans have increased since 2015. However, consistent with the sectoral and farm-level indicators, these farm loan delinquency rates remain below historical averages and below levels seen from 2010 to 2013,

when delinquency rates rose in the period following the housing crisis and Great Recession. While delinquency rates are low by historical standards, the study found some variation across regions. As of the fourth quarter of 2018, there was a 1.7-percentage-point spread in the farm real estate delinquency rates between the region with the highest rates (the Northern Crescent) and the lowest rates (the Heartland).

To gain insight into how farms would be affected if farm income continues to decline in the years ahead, we simulated the effect of a drop in gross cash farm income on the share of farms in extreme financial stress (low repayment capacity and high leverage). We find that if gross cash farm income were to fall by 20 percent from 2017 levels, the share of farms in extreme financial stress would increase the most in percentage-point terms for large-scale farms and for farms with a principal operator under age 40. We also estimate there would be a relatively large increase in the share of dairy operations in extreme financial stress.

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Appendix: Regional Disaggregation of Commercial Bank Data Using Regulatory Sources

This appendix describes how ERS researchers organized the Federal Deposit Insurance Corporation (FDIC) bank loan data and assigned loans to regions to derive regional loan volume and loan delinquency rates. The FDIC insured 5,477 institutions, including 4,774 commercial banks and 703 savings institutions as of the third quarter of 2018 (FDIC, 2018).¹³ These institutions' call reports provide information on agricultural debt and delinquency but do not provide any information on where their loans originated. However, institutions are subject to regulatory requirements that allow us to make assumptions about their geographic lending patterns. Specifically, we use a method that exploits the annual Summary of Deposits survey and data contained in Community Reinvestment Act reports.

Call report data are obtained and cleaned using guidelines outlined in den Haan et al. (2002). The banking universe is defined as FDIC-insured institutions within the United States that are chartered as either commercial banks or savings banks.¹⁴ Agricultural data are extracted from call report schedules RC-C (Loans and Lease Financing Receivables) and RC-N (Past Due and Nonaccrual Loans, Leases, and Other Assets). While loan volumes and select delinquency data are available as early as 1987, information on loans past due by 30 to 90 days are not present in the public call reports until first quarter 2001.

Following the Federal Reserve Bank procedures for agricultural delinquent volumes, two adjustments have to be made due to reporting practices. First, certain large institutions report production delinquencies on a consolidated basis only (identified with the acronym RCFD) and do not report domestic figures (RCON). To estimate domestic delinquent volumes, we adjust the consolidated volume using the ratio of the institution's domestic production loan volume to its consolidated production loan volume. As of the third quarter of 2018, this impacted 67 institutions representing \$11.9 billion in domestic production loan volumes, or roughly 15 percent of total production loan volume. These institutions reported \$12.5 billion in consolidated production loan volumes. Second, institutions below \$300 million in total assets are not required to report delinquent production loan volumes unless agricultural lending makes up more than 5 percent of their total loans. For these institutions, a delinquency average is calculated for similar institutions and is then applied to their agricultural loan volumes to create an estimate for delinquent volumes. While this impacted 1,647 institutions in our banking universe as of the third quarter of 2018, these institutions only represented \$1.6 billion in domestic production loans, or 2 percent of total production loan volume.

In order to locate the branches of each institution, we use data from the Summary of Deposits (SOD) survey. The SOD is an annual survey that requires banks to submit a list of bank branches they operate by county Federal Information Processing Standard (FIPS) code, as well as the deposits contained at each branch. Our universe of branches is restricted to bank branches that conduct retail services. An institution's agricultural loan volume is then assigned to each county it operates in proportion with interest rate expenses reported in the prior Census of Agriculture for both real estate

¹³While savings institutions are chartered differently than commercial banks, they face many of the same regulatory reporting requirements and are able to originate loans

¹⁴Unlike den Haan et al.'s work, this method does not exclude savings banks. Their analysis omitted savings institutions due to reporting issues that only impact years before this analysis.

and production loans. These can then be summed at the county level to create estimates for county-level real estate and production debt. For non-Census years, county interest expenses are estimated using linear interpolation.

This method of disaggregating loan volumes using the SOD and Census data is imperfect for two main reasons. First, institutions are not restricted from conducting some lending outside areas where they have a physical presence. Second, several major agricultural lenders are chartered as limited-purpose banks and have few bank branches despite large loan volumes. These limited-purpose lenders also tend to lend outside of their branch location.¹⁵

To address these additional issues, we use data from the Community Reinvestment Act (CRA) to disaggregate loan volumes when the data are available. The purpose of the CRA is to encourage banks to originate loans in areas where they collect deposits, including low- and moderate-income neighborhoods. Only institutions meeting certain asset thresholds are required to submit information related to the CRA.¹⁶ As part of their submission, institutions report a subset of their small farm originations, defined as loans with original amounts under \$500,000.¹⁷ However, small farm originations in the CRA are not broken down by real estate and production loan purposes. To obtain county estimates, the CRA data are used to identify additional counties in which a bank operated, which are added to the list of counties for each institution obtained from the SOD. Estimates for county volumes are again calculated using Census interest expense information. For institutions that do not report CRA figures, distribution is done using the SOD data alone.

To obtain delinquent loan volumes by county, we assume that each institution's delinquency rate is consistent across all regions in which it operates. This is a simplifying assumption that could introduce an additional source of error. Delinquent loan volumes are distributed using the same proportions used to distribute total loan volumes. Delinquent volumes are then re-aggregated at the region (county or ERS region) level and divided by total regional-level debts to obtain an estimate for a region's delinquency rate.

In sum, while efforts have been made to assign loan volumes and delinquent loan volumes to specific regions, the methodology is imprecise and required a number of simplifying assumptions that could potentially overstate or understate delinquency rates in a region.

¹⁵This issue typically impacts specialized lenders, such as those focused on implement dealer financing (e.g., John Deere Financial, f.s.b.).

¹⁶As of fourth quarter 2017, 14 percent of FDIC-insured institutions were subject to CRA requirements, representing more than 50 percent of agricultural loan volumes.

¹⁷Because CRA sets a threshold requirement, banks may underreport loans if they exceed the threshold. Generally, reported originations represent loans that go toward meeting an institution's CRA obligations. For most institutions, this includes loans in counties where they operate bank branches, or loans to counties that their regulator will give them CRA credit for, such as counties impacted by environmental disasters.