

Implications of a Low Interest Rate Environment for U.S. Agriculture  
Prepared for  
The Farm Credit System Coordinating Committee

by

Brian C. Briggeman, PhD  
Associate Professor and Director Arthur Capper Cooperative Center  
Department of Agricultural Economics  
Kansas State University

Shifts in monetary policy can have major implications for the agricultural sector. In the late 1970s and early 1980s, negative real U.S. interest rates quickly turned positive and coincided with a decline in U.S. net farm income. Today, real interest rates are again negative as the U.S. Federal Reserve has pushed their fed funds rate target to the zero-bound, where nominal interest rates cannot go below zero. Moreover, the Federal Reserve has also expanded its balance sheet and altered its composition by purchasing agency and mortgage-backed securities to provide liquidity to markets and stimulus to the U.S. economy. These changes in the size and composition of the Federal Reserve balance sheet have again raised questions about the impact of monetary policy and low interest rates on U.S. agriculture.

Research exploring the relationship between monetary instruments and agriculture is quite extensive. In the 1970s, shortly after the end of the Bretton Woods agreement, which allowed exchange rates to fluctuate against gold and the U.S. dollar became the world's reserve currency, Schuh (1974) discussed how over-valued exchange rates depressed U.S. agricultural production, exports, prices, and land values following World War II. Since then, a vein of research has explored the relationship between exchange rates and U.S. agriculture trade (Schuh, 1976; Chambers and Just, 1979 and 1981; Collins, Meyers, and Bredahl, 1980; Batten and Belongia, 1986; Orden, 1986). In general, these studies have found that agricultural commodity prices rise when the value of the U.S. dollar declines boosting agricultural exports. Conversely, agricultural prices tend to fall when the value of the dollar rises.

In the 1980s, a second vein of research explored the links between interest rates, money supply, and agricultural prices. To control inflation, the U.S. Federal Reserve changed its operating procedures from 1979 to 1982 to directly target the money supply instead of interest rates. The result was a spike in the fed funds rate, which topped at 19.1 percent in June 1981 and rising interest rates had a dramatic impact on agriculture as farmers were unable to cover their rising debt obligations. In 1982, Chambers and Just developed a structural model of the agricultural sector that included linkages to monetary instruments. For export dependent sectors such as agriculture, they found that tight monetary policy in the 1980s places upward pressure on the exchange rate, which leads to lower export activity and lower prices. Since then, other studies have found similar outcomes – tight monetary policy depresses agricultural commodity prices and incomes (Awokuse, 2005; Dorfman and Lastrapes, 1996; Orden and Fackler, 1989).

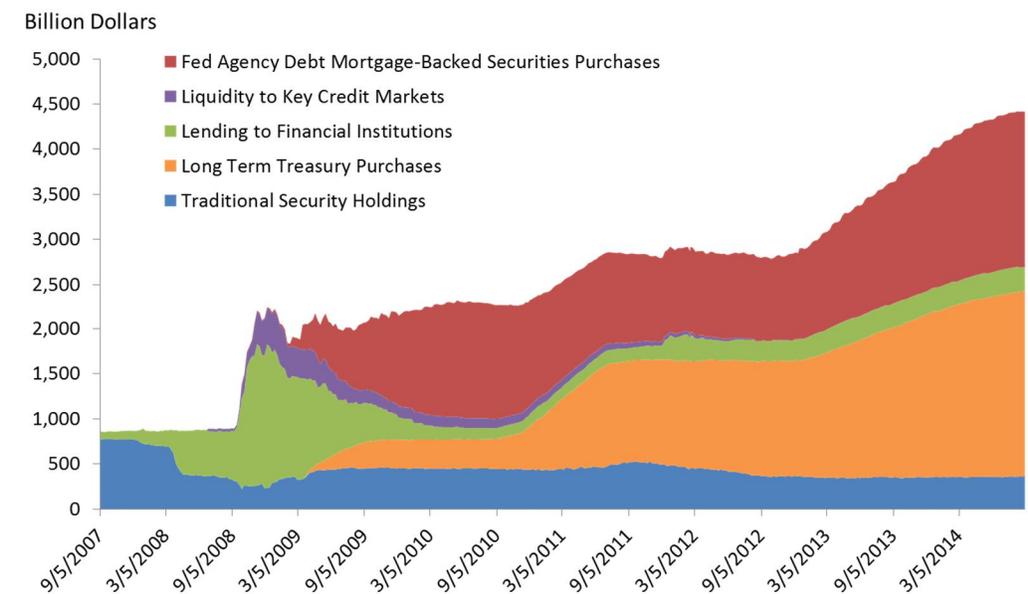
In contrast to the 1980s, recent shifts in U.S. monetary policy have fostered accommodative monetary policy to expand the money supply. Since 2008, U.S. agriculture has been affected by an unprecedentedly low interest rate environment. With the U.S. economy experiencing a severe recession and suffering a near catastrophic financial crisis, the Federal Open Market

Committee (FOMC) voted to drop the federal funds rate to the zero-bound and aimed at lowering longer-term interest rates through various quantitative easing programs. As a result, U.S. agriculture has been impacted to varying degrees through lower borrowing costs, lower capitalization rates, and higher farmer and non-farmer investing interest in U.S. agriculture. While agricultural commodity prices rose significantly, much of this rise is attributed to surging global demand and weather events. With that said, lower exchange rates, due to depressed interest rates, and massive amounts of liquidity in financial markets, helped accentuate the positive impact supply and demand had on commodity prices and incomes.

The objective of this paper is to explore the implications of today's low interest rate environment on U.S. agriculture as well as provide some talking points about how future interest rate changes might affect U.S. agriculture. The focus will be on the implications of the changing yield curve, capitalization rates, exchange rates, and commodity markets. Looking forward, interest rates will have to rise at some point in time, which could bring about a set of familiar challenges and opportunities for producers, lenders, and agribusinesses who serve U.S. agriculture. The key to thriving in a higher interest rate environment lies within some tried and true sound farm and financial management practices that have benefited many for decades.

### Monetary Policy in the Zero-Bound

The recession and financial crisis of 2008-2009 have strained traditional monetary policy actions. At the onset of the recession in December 2007, the U.S. Federal Reserve began to lower the fed funds target from 5.35 percent to a range between 0 and 0.25 percent in 2008. After reaching this zero-bound (the nominal fed funds target cannot go below zero), the Federal Reserve decided to engage in non-traditional, credit easing policies to expand their balance sheet from \$850 billion to nearly \$4.5 trillion in order to boost and sustain the economic recovery (figure 1).



Source: Federal Reserve Bank of Cleveland

Figure 1. Composition of U.S. Federal Reserve Assets

The Federal Reserve not only expanded their balance sheet, but also altered the composition of it, which raises questions about the ability to shrink the balance sheet once economic conditions improve. Traditionally, U.S. treasuries accounted for the bulk of the assets held by the Federal Reserve. As the financial crisis intensified in 2008, the Federal Reserve began to make loans to financial institutions, but offset these loans by selling some of their holdings of U.S. securities, thereby sterilizing the impact on the balance sheet, the monetary base, and money supply. As a result, the Federal Reserve's balance sheet held to around a more normal \$850 billion in assets.

The near collapse in financial markets in September 2008 led the Federal Reserve to expand their balance sheet aggressively through 2014. Initially, the Federal Reserve lent to financial institutions to get short-term credit markets functioning more normally. These unconventional measures were meant to be short-term fixes for financial markets, and the ballooning of the balance sheet up over \$2 trillion dollars in late 2008 was hoped to be temporary.

Unfortunately, the economy continued to sputter, which led the Federal Reserve to embark on some very unconventional monetary policy programs known as quantitative easing or QE. The first QE program or QE1 started when market conditions in the secondary market for home mortgages deteriorated. To foster liquidity in the housing sector, the Federal Reserve began to purchase long-term securities of housing-related government sponsored enterprises – Fannie Mae, Freddie Mac, and the Federal Home Loan Banks – and then eventually mortgage-backed securities backed by Fannie Mae, Freddie Mac, and Ginnie Mae. Together, these purchases held the Federal Reserve's balance sheet above \$2 trillion in assets.

Yet, the pace of the recovery slowed significantly in 2010, spurring additional easing of monetary policy. The second round of quantitative easing or QE2 was employed to provide support and potential growth to a weak recovery by lowering longer-term interest rates. To do so, the Federal Reserve committed to purchasing an additional \$600 billion of longer-term treasuries, which eventually pushed the balance sheet up to about \$3 trillion.

Finally, a persistent and lackluster economic recovery and stubbornly high unemployment rate, spurred yet another round of quantitative easing or QE3. In 2012, the Federal Reserve launched QE3 through an open-ended bond purchasing program and agency mortgage-backed securities at a clip of \$40 billion per month. Furthermore, the Federal Reserve communicated to the marketplace that their intent was to keep the Fed Funds Rate at the zero-bound until at least 2015. In December of 2012, these purchases were bumped to \$85 billion per month. All together, these three QE programs pushed the Federal Reserve's balance sheet to today's staggering level of \$4.5 trillion.

While the Federal Reserve's balance sheet growth has slowed in 2014, there are questions of the Federal Reserve's ability to shrink it back to pre-2008 levels. As of September 2014, the Federal Reserve has begun to slow its QE3 program by reducing its open-ended purchases, which has been known as "tapering." To fully remove these securities from their balance sheet, the Federal Reserve will either have to sell the securities on the secondary market or hold them to maturity. The ability to sell the securities depends on the willingness of private sector investors to purchase them. Interestingly, the lack of private sector purchases was a driving factor behind why the Federal Reserve purchased the maturities in the first place. The exit strategy from these unusual monetary policies will significantly impact the U.S. economy, especially agriculture.

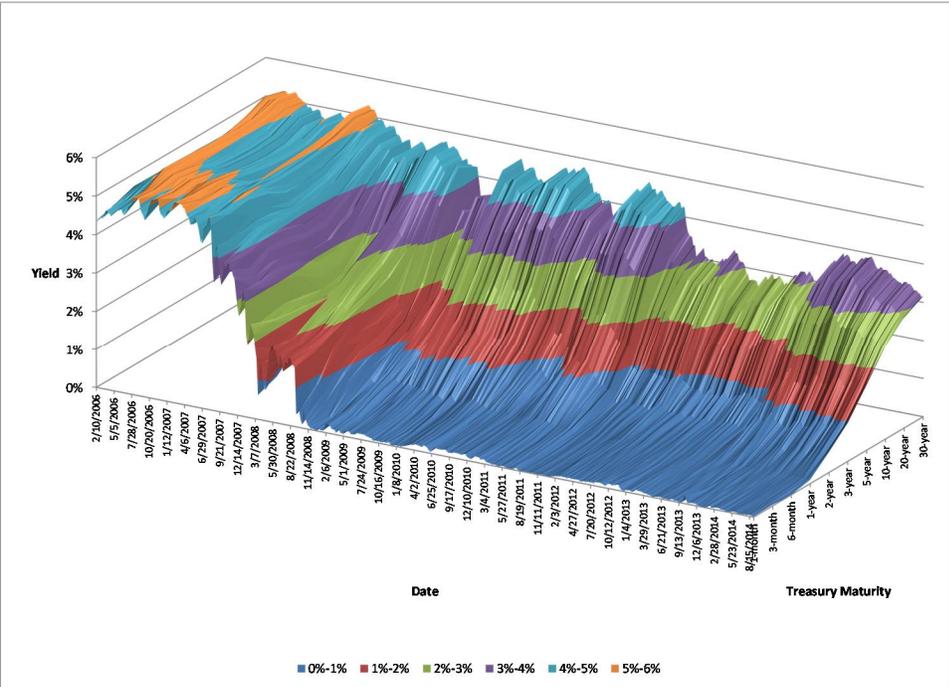
# Implications of Low Interest Rates and Expanded Fed Balance Sheet

With monetary policy wading in uncharted waters, there have been some noticeable impacts on and changes within the agricultural industry. Lower interest rates have pushed borrowing costs down, and provided a boost to farmland values through lower capitalization rates. Furthermore, commodity markets and net farm incomes have reached historically high levels. While drawing clear conclusions that the Federal Reserve is the reason for these generally positive outcomes is difficult, if not impossible, exploring the role of unconventional monetary policy on U.S. agriculture provides insights for how producers are impacted today. Furthermore, these insights will provide talking points for what producers might face when the Federal Reserve exits their accommodative policies and interest rates rise.

## The Yield Curve and Lower Borrower Costs

Lower interest rates have pushed down borrowing costs, especially short-term loan rates. Since 2006, the yield curve – a graph of interest rates of U.S. treasuries with differing maturity dates – shows that shorter term rates have fallen more drastically with the various QE programs than longer term rates. Still, overall agricultural borrowing costs have dropped. While lower rates have not spurred wide-spread excessive amounts of agricultural debt, there are some producers that have boosted their leverage position, which might be cause for concern in the future.

Before the recession and financial crisis, short- and long-term interest rates were nearly equal and higher compared to 2014 interest rates. From 2006 to mid-2007, the difference between short- and long-term U.S. treasury yields was on average less than 1 percent (figure 2). The yield range for less than 3-year maturity date U.S. treasuries was between 4 and 5 percent, which was similar for longer-term U.S. treasuries with maturity dates greater than 5-years.



Source: Federal Reserve Board of Governors

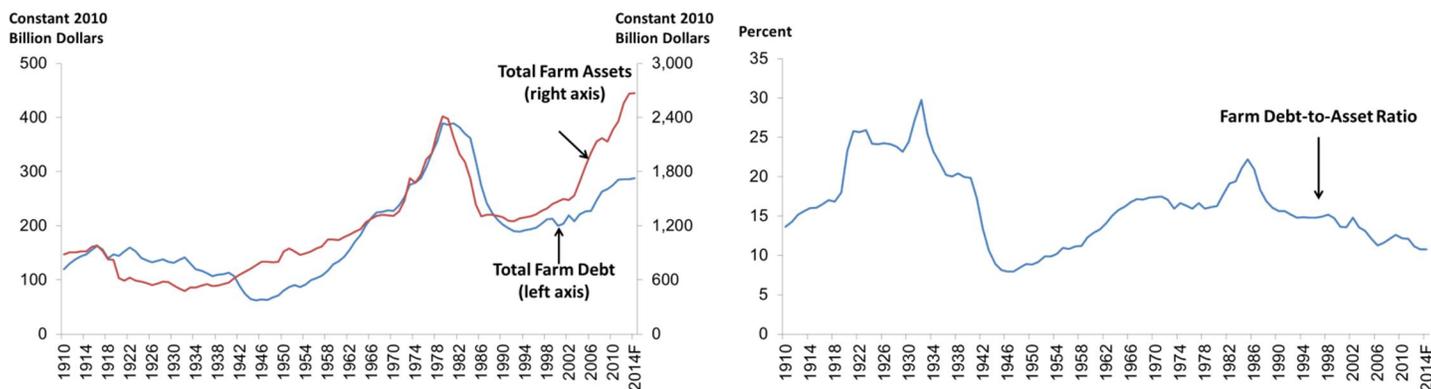
Figure 2. U.S. Treasury Yield Curve

In 2008, short term rates plummeted. As U.S. financial markets plunged into a crisis, the Federal Reserve response of pumping liquidity into the marketplace sent shorter-term rates sharply down more than 4 percent. Then, as we entered the zero-bound environment and multiple QE programs, interest rates or yields of securities with a maturity date 3-years or less have been held at historically low levels for over 5 years.

Longer term rates, however, have not been as responsive to this unconventional monetary policy. From 2008 to 2012, securities with a maturity date of 10-years or more consistently stayed around 5 percent. Then, in 2013, with a fledgling recovery and QE3, longer-term rates did dip to around 3 percent, but they never experienced the sharp downward movements as experienced in shorter-term rates. This highlights the difficulty for the Federal Reserve, or any central bank, in lowering longer-term interest rates to help stimulate economic growth.

Comparing long-term rates to short-term rates it is clear that the spread between the two has widened greatly, which creates an incentive for agricultural producers and businesses to borrow short-term funds. In early 2010, the difference between 10-year and 3-month U.S. Treasury securities was just over 3 percent, a historical high. While this gap has narrowed recently, this spread remains distinctly wide, making short-term funds significantly cheaper than longer-term funds. While hard data is difficult to obtain illustrating whether producers are taking advantage of this spread, some anecdotal reports support this statement. A number of agricultural producers and agribusiness have not locked in longer-term interest rates and opted for the shorter, cheaper variable interest rates. This protracted period of a wide spread has likely greatly benefited those who have taken advantage of variable interest rate financing.

While borrowing costs are low, most producers have not added excessive amounts of debt. After adjusting for inflation, total farm debt levels in the U.S. have risen during the low interest rate period of today, but remain well below the 1970s surge in debt (figure 3). Excluding the 1970s, today's inflation adjusted farm debt levels are in fact higher than any other period on record dating back to 1910. This is not terribly surprising given the rising costs of production agriculture as well as the recent surge in capital costs reflected in higher total farm asset values.



Source: Agricultural Finance Databook (1910-1959), USDA (1960-2014F)

Figure 3. Inflation Adjusted U.S. Total Farm Assets, Total Farm Debt, and Leverage

Furthermore, the recent rise in total farm debt may not be too concerning as leverage is well below other periods of stress. Since 1910, there have been two agricultural busts. Melichar (1977) shows that the 1920s and 1980s agricultural busts were both preceded by a run up in net farm incomes and significant capital and land expansions. He further argues that many farmers acquired too much debt and when farm incomes crashed, which triggered the bust, many farmers were too leveraged and declared bankruptcy. These two periods are clearly shown when plotting the farm debt-to-asset ratio over time (figure 3). Fortunately, today's leverage position, for the average producer, remains well below these highs (roughly 10 percent today compared to the 1932 high of 30 percent). In fact, leverage today is near the low experienced following the Great Depression and rash of farm bankruptcies.

However, there are segments of U.S. agriculture with an elevated leverage position. Elevated feed costs and the rising costs of production agriculture set the stage for some producers, such as livestock producers and younger operators, to increase their debt-to-asset ratios. Some recent research found that certain segments of agricultural producers are indeed quite leveraged. Featherstone (2012) shows that there are more highly leveraged producers, farm debt-to-asset ratios in excess of 50 percent, today than during the 1970s. Using Kansas Farm Management Association data, Featherstone estimates that there are roughly two times as many highly leveraged producers in Kansas today than in 1979. Featherstone has stated that one should not focus on the average debt-to-asset ratio, rather realize that the risk is in tails.

#### *Low Capitalization Rates and Higher Farmland Values*

Lower interest rates have also pushed down capitalization rates, which provide upward momentum for farmland values. Numerous reports from USDA to print media to reports from open outcry auctions have solidified that farmland values are at historically high levels. At the same time, farmland bubble chatter in print media has surged from a mere 100 media hits in the early 2000s to around 1,000 since 2010 (Widmar, 2014). Interestingly, these surging land values and bubble chatter in the media has coincided with the Federal Reserve's unconventional monetary policies. While the Federal Reserve is not the primary reason for this surge in farmland values, ultra-low interest rates have dropped capitalization rates, which has helped push up land values.

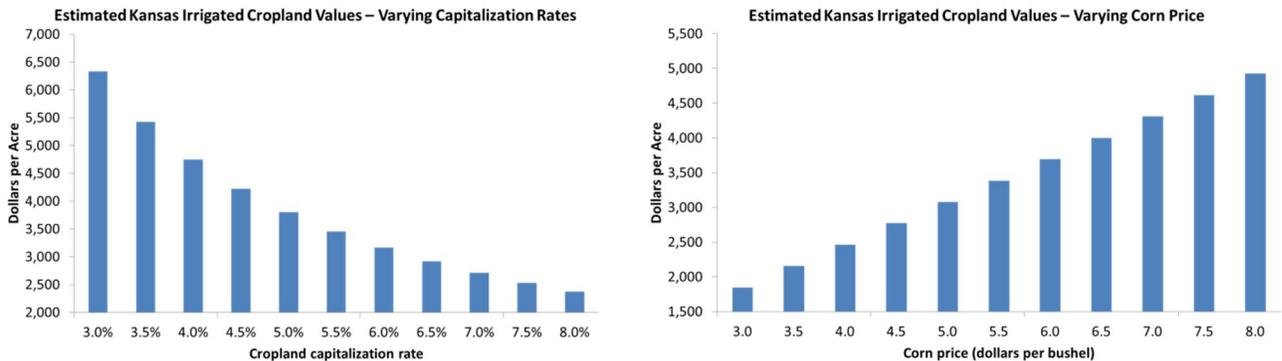
Farmland values have risen to historical highs with elevated farm incomes. Since 2000, agricultural supply and demand fundamentals have really set the stage for a strong rise in U.S. farmland values. Global commodity supplies were adversely impacted by various weather events throughout the U.S. and across the globe, which ultimately lifted commodity prices to record high levels. At the same time, demand for agricultural products surged with growing global populations and incomes sent U.S. exports booming. Furthermore, U.S. demand surged with the ethanol and the Renewable Fuels Standard.

While U.S. net farm incomes were booming, low interest rates pushed capitalization rates down, which provided additional support to surging farmland values. To illustrate the impact of interest rates on farmland values, a straightforward discounted cash flow model is used. Given farmland is an investment that should generate returns into perpetuity, the expected future net income from this investment should be capitalized into its value as follows:

$$\text{Farmland Value Per Acre} = \frac{\text{Expected Net Income Per Acre}}{\text{Capitalization Rate}}$$

Current market forces have provided a “double push” on farmland values. Elevated net incomes for farmers and bright outlooks on the horizon for these incomes have lifted farmland values. Furthermore, capitalization rates tend to follow overall interest rates. So, with the Federal Reserve implementing the zero-bound and various QE programs, capitalization rates have dropped. For example, the 20-year average capitalization rate for Kansas irrigated cropland sets around 6.5 percent (Dhuyvetter and Taylor, 2014). Today, that capitalization rate is near 4 percent. Following the formula above, lower capitalization rates have also contributed to the rise in farmland values.

To demonstrate the impact of capitalization rates on the value of farmland, the discounted cash flow model above is used to estimate the value of South Central Kansas irrigated cropland (figure 4, left graph). Using Kansas State University Cost-return Budgets, the estimated expected net income per acre is \$190 per acre. Using this number and varying the capitalization rate, it is clear that as the capitalization rate falls (moving from right-to-left on the left graph), cropland values rise. At today’s current capitalization rate of 4 percent in Kansas, South Central Kansas irrigated cropland should be valued around \$4,750 per acre. Farmland auction reports support farmers’ paying this amount for cropland in the area. Thus, current market conditions can justify these elevated values.



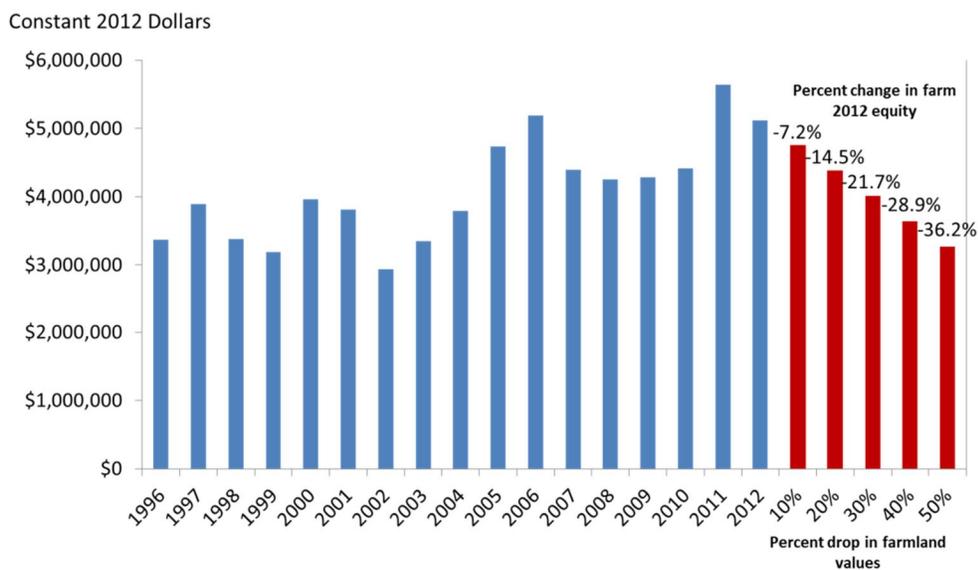
Source: Authors’ calculations based on Kansas State University Corn Cost-return Budget in South Central Kansas.  
 Left graph: assumed 200 bushels per acre, a corn price of \$4.75 per bushel, and 20% of gross revenues capitalized into land to estimated South Central Kansas irrigated cropland values.  
 Right: assumed 200 bushels per acre, 20% of gross revenues capitalized into land, and a capitalization rate of 6.5% to estimated South Central Kansas irrigated cropland values.

Figure 4. Discounted Cash Flow Irrigated Cropland Values for South Central Kansas

If capitalization rates were to rise, farmland values would fall significantly. At some point, interest rates will rise because they can only increase off of the zero-bound. Doing so will provide upward moment for capitalization rates. Let’s assume that the Kansas capitalization rate rose to its historical average of 6.5 percent and the corn price per bushel fell to its 2009 average price of \$4 per bushel, South Central Kansas irrigated cropland would fall to \$2,923 per acre, which is nearly a 40 percent drop (figure 4, right graph). Furthermore, to hold the \$4,750 per acre value at a historical capitalization rate of 6.5 percent, it would take a corn price of \$7.50 per bushel.

While these fairly realistic changes to capitalization rates could occur, it is unlikely a 1980s type farmland bust will occur. The primary reason is because of the overall low leverage situation within U.S. agriculture shown earlier. Plus, numerous anecdotal reports suggest many are using cash to purchase farmland or are putting down significant cash down payments. Remember, too much leverage was a key component in the 1920s and 1980s farmland bust. Today, leverage does not appear to be as prominent nor as much of a widespread issue.

Where a drop in farmland values would be more of a challenge for producers would be a reduction in their borrowing base. Briggeman (2011) estimated that a reduction in farmland values would lead to significant drops in equity for large farms with more than \$1 million sales and producers younger than 35 years old. These two groups were highlighted because each has a strong reliance on debt to capitalize their growing operations. Briggeman highlights that if farmland values were to fall somewhere between 10 and 50 percent, the decline in equity for these producers groups would range from 7 to 40 percent (figure 5). A 50 percent decline in farmland values would wipe out all equity gained in this last agricultural boom. Erasing that amount of equity could lead to significant financial stress, especially for producers that depend on debt to capitalize their operations.



Source: USDA Agricultural Resource Management Survey

Figure 5. Farm Equity for Farms with \$1 Million or More in Sales

### Commodity Markets

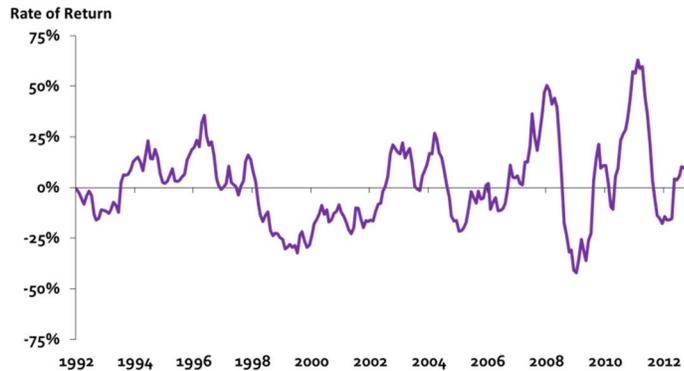
Commodity markets have also likely been impacted by today's accommodative monetary policies. In particular, the excessive amount of liquidity in financial markets has likely played a role in impacting agricultural markets as exchange rates have dropped and the volume flowing through commodity markets has reached unprecedented levels. As has been well documented in the academic literature and discussed earlier, low interest rates push down exchange rates, which in turn provide upward support for commodity prices. Today's commodity prices have experienced a similar boost. A relatively new debate has spurred regarding the impact of excess

liquidity in the marketplace. Since 2001, open interest in the corn futures market has, on average, more than doubled. With this recent surge in volume, and a lot of it coming from commodity index traders, many are left wondering what impact that might have on agricultural commodity markets.

A significant rise in commodity market liquidity has sparked a heated debate about the financialization of commodities. Masters and White (2008) contend that commodity market speculators are driving up the price of commodities and food prices around the globe. Irwin and Sanders (2011) refute this argument stating that the empirical evidence does not support such claims. The point from here on is not to make arguments that fall in Irwin and Sanders' camp or in Masters and White's camp. Rather, the aim is to discuss what role today's unconventional monetary policy might play in agricultural commodity markets, and discuss what are some plausible reasons why the number of commodity index traders, who typically hold long contracts, now typically make up 40 percent of the market. One thing both sides can agree on is that today's commodity futures markets are very liquid. And, this liquidity provides opportunities for producers' to mitigate their own price risk, but it also provides opportunities for those outside of agriculture, such as commodity index traders, to mitigate their own risk, such as inflation.

The zero-bound interest rate environment has significantly altered risk premiums and potentially investor behavior. Before making an investment, investors will want to assess the investment's risk premium, which is the difference between an expected return on an investment and the risk free rate of return. Today, that premium has been artificially widened because the risk free rate has fallen to near zero (the interest rate on 3-month U.S. treasuries trading near zero). With such a low risk free rate, it seems plausible that investors will seek out other investments that might have a much higher rate of return (the proverbial "reaching for yield") or gravitate towards investments that might have what would be considered a lower expected return but is safe. Thus, investing in U.S. agriculture, given its bright outlook and relative safety compared to many other volatile industries, might attract investors.

In fact, the risk premium landscape for agricultural commodity markets has improved. To illustrate this point, an agricultural commodity risk premium was created by taking the difference between the Dow Jones Agricultural Commodity Index Rate of Return and the risk free rate (figure 6). From 1992 to 2006, the agricultural commodity risk premium moved between -25 and 25 percent, and had an average equal to -2 percent. These numbers do not provide much of an incentive to invest in agriculture commodities. However, moving into the period in question from 2007 to 2012, market incentives for investors do improve as the risk premium average jumped to 9 percent with a range of 75 percent and -50 percent.



Source: Author's calculations using data from Dow Jones and Federal Reserve Board of Governors

Figure 6. Agricultural Commodity Risk Premium

Looking forward, one must question how commodity markets might transition when the Federal Reserve begins to exit their accommodative monetary policies. Removing the zero-bound and absorbing the excess amount of liquidity could remove the excess risk premium in agricultural commodity markets. When this happens, how might investors react? Will they leave? Or will they continue to purchase commodity derivatives and provide ample liquidity? Unfortunately, these are questions that cannot be answered today. With that said, even if some of the commodity index traders were to leave, it is hard to imagine that agricultural commodity markets would be adversely affected. These markets have been functioning well for years and, in the end, it is the supply and demand fundamentals that drive agricultural commodity markets and net farm incomes.

#### When and How Quickly Might Interest Rates Rise?

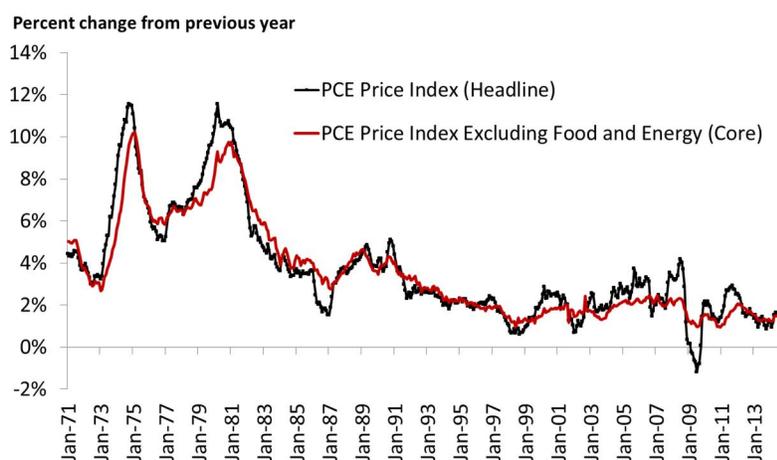
A rise in interest rates might portend the end of the recent agricultural boom. During the 2007 recession and financial crisis, most industries struggled except for agriculture. While many companies were laying off employees and slashing capital expansion plans, U.S. agricultural producers and agribusinesses were enjoying booming incomes and expanding their machinery line, infrastructure, and acreage (as evident in the farmland discussion above). Yet, this low interest rate environment will not last forever. The academic literature clearly demonstrates a tight monetary policy environment with high interest rates hinders the agricultural economy. Furthermore, high interest rates tend to coincide with lower commodity prices, which would put further stress on the U.S. agricultural industry. So, when will interest rates rise?

Many started asking this very question almost as soon as the Federal Reserve moved the economy into the zero-bound interest rate environment. Instead of asking when will interest rates rise, we have already experienced longer term rates increasing slightly, a better question is how quickly will they rise? Remember that it was the rapid rise in interest rates during the late 1970s and early 1980s that caused much damage to the agricultural economy. To explore the potential speed to which interest rates might rise, the inflation environment will be discussed. While it is difficult to forecast future inflation and when interest rates will rise, further examining the massive liquidity situation in financial markets should provide insights into what might trigger higher future interest rates.

### *Inflationary Concerns, Excess Reserves, and the Velocity of Money*

Today's excessive amount of liquidity has some fearful that inflation could rise rapidly. These fears may be warranted as the U.S. has experienced a rapid rise in inflation in the past. During the 1970s and early 1980s, the U.S. felt the economic pain of surging inflation as prices on goods and services rose rapidly. Arguably the biggest hit to the economy was not surging prices, but the remedy for the out-of-control inflation, historically high interest rates. Interest rates skyrocketed to over 20 percent, which caused many individuals and businesses to declare bankruptcy as their interest payments soared. Today, interest rates are low and so too is inflation. However, the massive amount of liquidity in the marketplace has some wondering if the stage is set for rapid inflation, which by definition is "too much money chasing too few goods." The massive amount of liquidity leads one to believe there is "too much money." It is possible that economy has recovered enough to where "too few goods" is no longer an issue, but it certainly was during and following the 2007 recession. However, the "chasing" or velocity of money is at historically low levels, which has dampened inflation and very well might be the key to the evolution of future inflation.

At the onset of the 2008 financial crisis, the primary concern was actually deflation. There were significant and justifiable concerns that the U.S. economy would fall into a deflationary environment. The economy was sputtering, financial markets were seizing, inflation was dropping, and fears were mounting that prices and wages would freefall into a downward spiral. These fears were emboldened when the headline personal consumer expenditure (PCE) index moved into negative territory (figure 7). This occurred primarily because food and energy prices fell dramatically. Some were fearful that the less volatile core PCE index, which excludes food and energy, would continue falling and move into negative territory. That would be a clear signal of deflation.



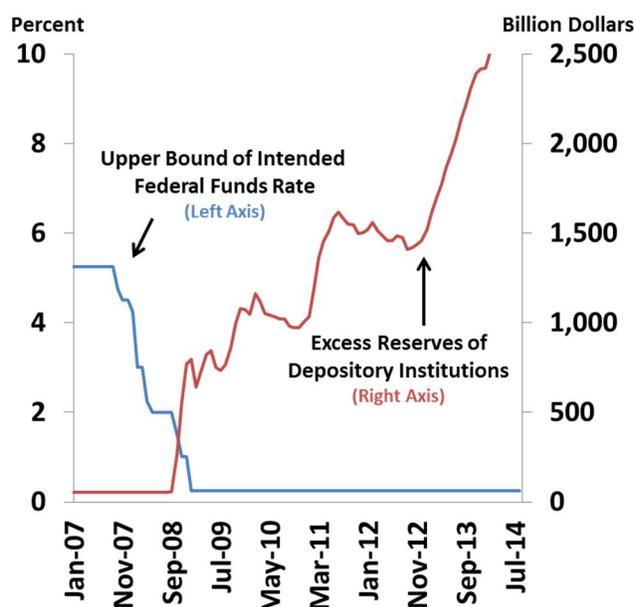
Source: U.S. Department of Commerce: Bureau of Economic Analysis

Figure 7. Personal Consumption Expenditures (PCE) Price Indices

Fortunately, deflationary fears have subsided. By in large these fears have been dampened as inflation has picked back up. Since 2008, inflation has increased but remains low relative to other high inflationary periods in U.S. history. Compared to the 1970s exceptionally high core inflation measure of 10 percent, today's inflation measure being below 2 percent is quite small.

In fact, this low measure has been cited by the Federal Reserve as being too low relative to their preferred, consistent 2 percent measure, and further justification for maintaining their very accommodative monetary policies.

Yet, these policies have some concerned about a sharp rise future inflation. In particular, these concerns center around the massive amount of excess reserves depository institutions are holding at the Federal Reserve. As the Fed expanded its assets, the Fed's liabilities also rose as depository institutions' excess reserves ballooned to over \$2.5 trillion (figure 8). These excess reserves have surged because of zero-bound interest rates, numerous QE programs, and uncertainty in the economic recovery.



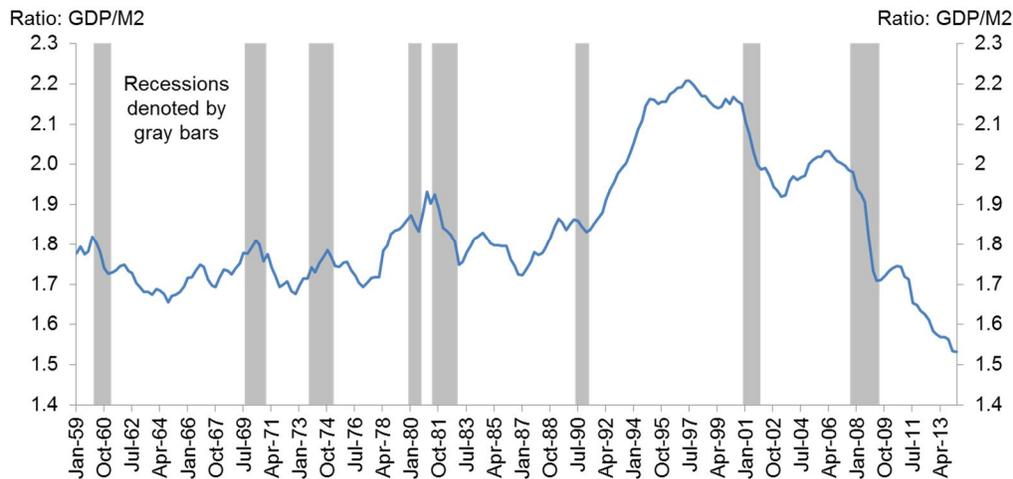
Source: Federal Reserve Board of Governors

Figure 8. Federal Funds Rate and Excess Reserves of Depository Institutions

Fortunately, these excess reserves cannot be directly lent out by depository institutions. Sheard (2013) shows that the rise in excess reserves are a product of the Federal Reserve purchasing assets from private investors and crediting these investors' deposit accounts with banks. As a result, banks cannot use these funds to loan them out into the marketplace because it is the Federal Reserve that controls them.

What this rise in excess reserves is reflective of is the massive amount of liquidity the Federal Reserve has pumped into the economy and the decline in borrowing and lending. Before the 2008 Financial Crisis and recession, depository institutions only had about \$50 billion of excess reserves. The reason these reserves were so low was because the Federal Reserve was not embarking on QE programs and U.S. individuals and businesses were not in a period of deleveraging their balance sheet. Today, that is not the case. The disruption and collapse in a more normal borrowing and lending environment is reflected in the velocity of money (figure 9). The velocity of money is essentially a turnover ratio calculated by taking the U.S. gross domestic product (GDP) divided by the money supply (M2). So, plotting the velocity of money

over time one can see it increase, which means GDP or economic growth is rising faster than money supply. If velocity falls, GDP is typically falling, as in recessionary periods, or the money supply is rising faster than GDP growth.



Source: Federal Reserve Bank of St. Louis

Note: Velocity of Money = Gross Domestic Product (GDP) / Money Stock (M2)

Figure 9. Velocity of Money

Recently, the U.S. has experienced a steep and persistent decline in the velocity of money. Before the 2007 recession, the velocity of money was at 2 or for every \$1 of money stock there was \$2 of GDP. Today, velocity has fallen to 1.53, a historical low. A primary reason for this persistent decline is the steep rise in the money stock which has not been followed by a rise in GDP. One reason GDP growth has not been stimulated by additional money stock growth is the significant amount of uncertainty in the marketplace (economic, financial, and government). Anecdotal evidence supports this assertion as many businesses have stated that elevated uncertainty has inhibited them from borrowing and investing funds. In addition, given uncertain economic growth and the recent financial crisis, lending institutions have been under tighter regulatory control, which limits their ability to lend money. All of this has led to the collapse in the velocity of money.

Looking ahead, a pickup in velocity could signal higher inflation. For a significant rise in inflation, the massive amount of liquidity in the marketplace (too much money) will need to start flowing into the system (chasing) a limited amount of goods (too few goods). While today's slow economic recovery has created too few goods, all of the associated uncertainty has not spurred any "chasing" or the velocity of money has remained low. As the economic recovery becomes more stable and businesses and consumers become more confident the financial system will likely start to function more normally, borrowing and lending will rise, pushing up velocity. Depending on how fast this occurs, will largely drive how quickly inflation increases.

To cool the economy's growth and keep rapid inflation at bay, the Federal Reserve will need to let interest rates rise at some point. Many Federal Reserve officials and economists have stated that they expect interest rates to rise in mid-2015, albeit a small increase. An improving

economy and months of signaling to the financial markets gives strong support to this forecast. No one knows exactly how much interest rates will rise because the increase will be tied to economic data on that future date as well the outlook (the Congressional Budget Office projects the short-term interest rate rise to be small, around 25 basis points). How it will occur will likely be a three part process. First, the Federal Funds Rate will move off of the zero-bound. Second, interest rates paid on excess reserves will rise. Finally, the interest rate paid on short-term Treasury securities by the Federal Reserve's overnight reverse repo program could increase in an attempt to set a floor under short-term interest rates.

Taken together, this is how the Federal Reserve plans to move the U.S. economy into a higher interest rate environment and continue their exit strategy. How well it all unfolds is truly up for debate. With that said, it is very likely that the process will lead to volatility in financial markets. Why? The Federal Reserve has never had a balance sheet this large nor been in a zero-bound interest rate environment. Furthermore, the market has adjusted to these policies. Unwinding and exiting these unconventional policies in a systematic way to limit or not cause rampant volatility will be a great challenge for the Federal Reserve. Furthermore, individuals and businesses should be prepared for this exit strategy because it will clearly usher in higher interest rates.

#### How Should Producers Respond?

While agricultural producers must recognize that much of what has been discussed up to this point is out of their control, they can monitor the situation and implement sound business practices that can mitigate the downside effects of higher interest rates. Monitoring the public discourse of Federal Reserve statements might be the best indicator of when interest rates will rise. Decisions to alter monetary policy and interest rates solely lie with the Federal Reserve. These decisions have an impact not just within the U.S., but across the globe. Remember also that the market makes decisions based on a set of expectations, and the Federal Reserve public statements feed into these expectations. Given the Federal Reserve has been given such a tremendous responsibility, they are extremely careful with how they communicate to the marketplace. As a result, they take this communication very seriously.

To this point, Federal Reserve statements have strengthened on the expectations that interest rates will begin to rise in mid-2015. While this could change if the U.S. economic recovery were to sputter, many economic reports and forecasts point to improved U.S. economic growth. So, producers should be proactively preparing for a rise in interest rates (whether it is in 2015 or later) by employing sound business decisions. In fact, many of these decisions have helped them manage through a number of volatile periods in U.S. agricultural history. Here are six items producers can do to prepare for the pending rise in interest rates.

1. *Know breakevens and exercise a sound and consistent marketing plan.* During 2014, crop profit margins have tightened as commodity prices fell and input costs rose. The December 2014 future corn contract has fallen above \$5 per bushel to around \$3.25 per bushel. Many other commodities, such as soybeans and wheat, have experienced similar price drops. Furthermore, for crop farmers, input costs have remained elevated, and it is likely they will not recede in the near future. As a result, crop profit margins have narrowed considerably.

At the same time, livestock producers have experienced just the opposite impact on their profit margins. Commodity prices falling has been a welcomed reprieve for them as they have endured elevated feed costs for a number of years. Furthermore, livestock prices have risen sharply primarily because of a contraction in livestock supplies.

Even though the outlook for livestock producers might be brighter than crop farmers, a tried and true statement in production agriculture applies to both producer types, profit margins can and most likely will fade quickly. To work through the periods of tight profit margins, all agricultural producers should know their breakevens and exercise a sound and consistent marketing plan. Knowing your breakeven costs of production can allow a producer the ability to lock in profits when they present themselves. To do so, producers should not get caught in the trap of trying to beat the commodity futures market to lock in the highest price possible. Regardless of what grain or livestock marketing plan is employed, the key is to have a plan and to implement the plan consistently. Doing so should aid producers in smoothing the volatility in commodity prices and provide them opportunities to lock in profit margins.

2. *Maintain or improve production efficiencies.* As profit margins tighten, a greater emphasis should be placed on controlling efficiencies and costs. Producers should start with a careful examination of how they are utilizing their assets. That is, are producers maximizing the potential and returns from all of their assets such as their machinery complement, pen and barn space, and farmland? If the assets are not returning enough benefit back to the operation, is there a way to change the asset mix such as culling underperforming assets through possible lease or share agreements. Conversely, are certain assets being underutilized and their full potential is not being met, such as spreading out the machinery compliment over more acres or enhancing the production capacity of farmland through irrigation or tiling. Finally, to the extent a producer can, lowering or maintaining low costs of production has been a tried and true staple for the success of many farms and ranches.

3. *Maintain a strong balance sheet.* Many producers likely already have a strong balance sheet. Since 2008, soaring net farm incomes and farmland values have boosted producers' liquidity and equity positions. Liquidity or working capital are those assets that are either cash or can be quickly turned into cash after meeting all current liabilities. When profits tighten or volatility increases, ample liquidity provides producers with a cushion to meet coming expense and/or debt obligations. Furthermore, liquidity can be used as funds or "dry powder" to quickly seize opportunities. So, there are strong incentives for a producer to maintain an adequate liquidity position.

Many producers have also experienced a sizable increase in their solvency or equity position. Certainly, soaring land values have helped lift asset levels well above liability levels which in turn lifted equity. In addition, many producers have recently paid down their liabilities. This expanded solvency or equity position should benefit producers going forward if they need to acquire debt capital during a period of tighter profit margins.

Of course, there are likely producers who have a very weak balance sheet. These producers may have a negative working capital position (current liabilities exceed current assets) or their solvency position may reflect too much debt (debt-to-asset ratio above 80 percent). For these producers, tighter profit margins and higher interest rates will likely lead to financial stress and

possible bankruptcy. For high risk producers, careful cost management and examination of asset utilization should be done sooner rather than later.

4. *Implement a Stress Test.* A straightforward stress test of a producer's balance sheet, income statement, and cash flow could be a way to identify potential financial concerns. By no means does this stress test need to be complicated. The place to start would be to decrease key asset values and revenues and increase expenses on a producer's financial statements. After doing that, examine the resulting changes to key financial ratios. For example, try decreasing the farmland values on the balance sheet by 10 percent, 33 percent, and 50 percent (similar to what was done in figure 5 above). How high does the debt-to-asset ratio rise? Does it significantly rise to a point that a lender will start limiting the amount of debt capital provided to the operation? If yes, then there would be concerns of an eroding borrowing base. Or, does it merely amount to a loss of "paper equity" that will not be realized because the farmland will not be sold? If yes, then this is likely not a concern.

The key for any stress test is to do many changes to the financial statements and then compare the results to a set of benchmarks. These benchmarks can come from a number of sources including an operation's own historical financial statements. Comparing to historical financial statements can provide those insights into how far your stress test might set you back. For example, if revenues fall to pre-2008 levels, will my profit margins be similar today as in 2006 or might they be worse because costs have risen? Other sources to acquire benchmark information would be the producer's state's land grant university's farm financial information. Many university's extension services provide these types of benchmarks. The key is to make sure a producer is comparing their operation to a similar operation of size and production focus (e.g. livestock versus crop).

5. *Be prepared for a rise in short-term interest rates.* If the Federal Reserve does indeed raise short-term interest rates in 2015, variable interest rate will increase. Now, is this an indication that producers should lock in fixed interest rates to prepare for a pending variable interest rate rise? Unfortunately the answer is, it depends. If the expected variable interest rate increase is enough to wipe out the benefit of short-term financing, that is wipe out the existing spread between short-term and long-term interest rates, then the answer would be yes to locking in fixed interest rates. On the other hand, if the expected variable interest rate increase is minor and slow, then maintaining variable interest rate financing and capturing these cheaper interest costs might be best.

Making the decision between variable and fixed interest rate financing really depends on a producer's risk tolerance and their relationship with their lender. Risk averse producers will likely want the assurance of known interest costs with fixed interest rates. More risk tolerant individuals might prefer variable interest rates and the potential for lower interest costs. Finally, producers need to have open communication about these decisions with their lender because in the end, the lender will ultimately be the one approving the financing decision.

6. *Invest in opportunities.* Even if profit margins continue to tighten and interest rates rise in 2015, there will be opportunities for producers to improve or enhance their operations. While it is difficult to forecast when and where these opportunities might arise, following items one through five above are within the control of the producer and can help ensure they do not miss

these investments when they appear. The key before making these investments is to ensure they (1) enhance the economic value of the operation; and (2) fit the strategic direction of the business.

In summary, today's accommodative monetary policy has had an impact on U.S. agriculture. While these impacts have varied, they in general have provided an additional boost to the already favorable supply and demand fundamentals. Looking forward, interest rates will have to rise and that could have a negative and reverberating impact throughout agriculture. Following good sound business practices should help ensure today's U.S. agricultural producer will not only survive these likely initial negative impacts but thrive in a higher interest rate environment.

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