

GENERAL SESSION I
***Impacts of the Financial Market Crisis
on the Agriculture Sector***

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Abstract/Summary

The last half of 2008 was one of the more turbulent times since the Great Depression. The origin of that turbulence were sown years previously due to a variety of reasons including historically low interest rates, lax credit standards in the home mortgage market partially encouraged by the U.S. Congress, and bad decisions made by market participants including mortgage lenders, mortgage borrowers, and Wall Street. The results of the crisis has been a tremendous destruction of wealth globally, reduced credit availability, and a low level of consumer confidence that has not been seen in nearly 30 years. At the same time, the U.S. agricultural sector during 2008 was very healthy. In some respects, the health of the production agricultural sector is as good as it has been in nearly 30 years. However, there are certainly some ominous features on the horizon that could affect the health of the agricultural sector. This presentation will examine the Financial Crisis and its impacts on the agricultural sector.

Impacts of the Financial Market Crisis on the Agricultural Sector

Allen M. Featherstone¹

Introduction

The last half of 2008 was one of the more turbulent times since the Great Depression. The origin of that turbulence were sown years previously due to a variety of reasons including historically low interest rates, lax credit standards in the home mortgage market partially encouraged by the U.S. Congress, and bad decisions made by market participants including mortgage lenders, mortgage borrowers, and Wall Street. The results of the crisis has been a tremendous destruction of wealth globally, reduced credit availability, and a low level of consumer confidence that has not been seen in nearly 30 years. At the same time, the U.S. agricultural sector during 2008 and 2009 was generally very healthy although certainly some sectors are being stressed. Overall, the health of the production agricultural sector is as good as it has been in nearly 30 years. In the middle of 2009, there are certainly some ominous features on the horizon that could affect the health of the agricultural sector.

U.S. Financial Crisis

The root of the U.S. financial crisis can be traced to the housing market. The U.S. housing market is completing a rapid decline in housing values caused by a housing bubble. In some respects, the conditions of the housing bubble were very much like the U.S farm crisis in the 1980s. Housing prices had increased for over 20 years, leading many to believe that housing was an investment that would never lose value. This led to collateral value based lending with little emphasis on repayment capacity because an appreciating asset could be refinanced at an increased value if mortgages were not repaid. In addition, the U.S. Congress encouraged lenders to relax credit standards further by lending to subprime borrowers, i.e., borrowers who did not meet normally established underwriting guidelines. This further increased the demand for housing, pushing home values higher while at the same time decreasing the overall credit quality in the home mortgage market. In addition, the U.S. Federal Reserve maintained historically low interest rates and banks often offered mortgages with special below market teaser rates for the first few years of the loan. Many banks moved these mortgages off their books by selling them to Fannie Mae or Freddie Mac who repackaged these mortgages and sold them on the open market to Wall Street investors. However, when the teaser rates expired and interest rates reset to market rates, many of these subprime borrowers found that they were unable to make the payments under market interest rates and were unable to refinance their housing mortgages due to the decreased value on their house. This led to bankruptcies in the mortgage market and those investors who had financed the housing mortgage market through the purchases of various financial instruments and derivatives experienced loss.

Figure 1 illustrates housing values beginning in 1987 on the left axis². From the first quarter 1987 to the first quarter 1999, the index of housing prices increased from 62 to 100 at an annual rate of 3.3%, in line with historical norms. From then until the second quarter of 2006, housing values increased at an annual rate of 10.5%. Since the second quarter of 2006, housing prices have lost roughly 32.2% of value at an annual loss of 13.2%. To understand how much longer housing prices may decline, it is useful to project the current housing index value from 1999 if housing prices would have increased at the longer-term annual rate of 3.3%. The value at end of the first quarter 2009 would have been roughly 128.0, compared to the actual value of 128.8. This still leaves roughly another 0.6% decline for housing values to reach

¹ Allen Featherstone is a professor in the Department of Agricultural Economics, Kansas State University. I wish to acknowledge the helpful comments of Vincent Amanor-Boadu and Terry Kastens on an earlier draft of this paper.

² The housing price index data are the S&P/Case Shiller Home Price Indices, U.S. National Values found at http://www2.standardandpoors.com/spf/pdf/index/csnational_value_052619.xls.

that longer term trend line assuming that values do not over adjust downwards as they often do after a bubble.

While the financial market crisis originated in the housing market, the effects began to spread to other markets. The right axis of Figure 1 illustrates the credit quality of U.S. banks³. In 1987, nonperforming loans were measured to be 3.81% of total loans. That percentage fell to 2.92% during the fourth quarter 1988 before increasing to 3.91% in the third quarter of 1991. After 1991, nonperforming loans decreased rapidly for the next 4 years and then gradually decreased to 0.94% during the last quarter of 1999. The nonperforming loan rate increased to 1.51% during the third quarter of 2002 before declining again through the second quarter of 2006 when it reached an observation period low of 0.70%. After that, nonperforming loans increased rapidly to the most recently reported value of 3.76% (first quarter of 2009). Housing values peaked during the second quarter of 2006 while the default rate was at a low point. The correlation between these two measures is -0.56 with a t-test of -6.35 indicating a strong negative statistical relationship between the two series.

The housing bubble was exacerbated by continued decreases in the 30-year mortgage interest rates⁴. Mortgage interest rates from 2002 and forward fell below 7.5% and have remained lower than at any time since 1970 (Figure 2). Since the 1982 recession, 30 year mortgage rates have continued in a general downwards trend. The grey bars in Figure 2 represent recessions in the U.S. economy. Interestingly, the 30 year mortgage rates never trended upwards after the end of U.S. recessions. Certainly the rates would be expected to decrease when monetary policy was relaxed to increase economic activity. However, a more normal cycle would be for the rates to begin to increase after a recession ended.

Originally, it was thought that the issues in the home mortgage market could be isolated with little effect on the broader market. However, that ultimately was not the case. The effects of the housing bubble and associated defaults began to pull the U.S stock market downwards beginning during the fourth quarter of 2007. Since the peak of the market in October 2007, the Dow Jones market index has decreased by 49.3%. The decrease in the market has coincided with a large drop in consumer confidence and a large increase in the unemployment rate (Figure 3).

Consumer confidence (left axis in Figure 3) had been falling from its high in January 2000⁵. During the second quarter of 2006, the consumer confidence index averaged 83.8. From there it increased to a level of 96.9 during January of 2007. From there it fell to 78.4 in January of 2008 and to 61.2 in January 2009. Since April of 2009, the consumer price index has remained in the in the upper 60s which continues to be similar to the levels of the early 1980s, which was a monetary induced recession to rid the U.S. economy of stagflation. The unemployment rate (right axis in Figure 3) has increased from 4.4% in March 2007 to 9.5% in June 2009 before falling to 9.4% for July 2009⁶. The correlation between consumer confidence and the unemployment rate is -0.50 in the same month. However, if the unemployment rate is lagged by 12 months, the correlation increases to -0.72 which illustrates the leading indicator properties of the

³ Nonperforming loans are those that are past due for 90+ days. The ratio is divided by total loans for all U.S. banks. The data are from the Federal Financial Institutions Examination Council via the St. Louis Federal Reserve Bank, <http://research.stlouisfed.org/fred2/fredgraph/>.

⁴ The 30 year conventional mortgage rates are from the Board of Governors of the Federal Reserve System via the St. Louis Federal Reserve Bank, <http://research.stlouisfed.org/fred2/fredgraph/>.

⁵ The data on consumer confidence are from the University of Michigan Consumer Sentiment Survey and are reported via the St. Louis Federal Reserve Bank, <http://research.stlouisfed.org/fred2/fredgraph/>.

⁶ The data on the civilian unemployment rate are from the U.S. Department of Labor, Bureau of Labor Statistics reported via the St. Louis Federal Reserve Bank, <http://research.stlouisfed.org/fred2/fredgraph/>.

consumer confidence index. Thus, based on the drop in consumer confidence, the unemployment rate in the U.S. is likely to continue to increase for the next six months⁷.

Comparison to the Great Depression

A Depression is often defined by economists as a period in time where inflation adjusted GDP declines by more than 10%. Using this definition, the last depression in the U.S. occurred from May 1937 to June 1938 when real GDP declined by 18.2%⁸. Currently, real GDP in the U.S. has declined by 3.9% since the second quarter of 2008. The Great Depression was an economic downturn that lasted for ten years. During the Great Depression the real growth in the GDP was negative for four years, declining by 26.5%. Figure 4 compares the inflation adjusted GDP and the inflation adjusted stock market average since 1929⁹. Although the series are highly correlated (0.853), the stock market has had periods of time where it did not follow the real GDP.

The declines in GDP led to unemployment increasing to roughly 25% during the Great Depression. Figure 5 illustrates the annual unemployment rate since 1929 in the U.S.¹⁰. The unemployment rate was 3.2% during 1929 and increased to 8.9% during 1930. The unemployment rate continued to increase to 24.9% during 1933. After 1933, the unemployment rate began to drop, although it still was above 10.0% until 1940. After 1940, unemployment dropped rapidly with the U.S. involvement in World War II. The unemployment rates have remained generally low except for the early 1980s, when rates increased to 9.7% and 9.6% in 1982 and 1983, respectively.

Figure 6 examines the percentage decrease of the Dow Jones from the high of 380.33 in August 1929 through the Great Depression. The graph continues until the market exceeded the August 1929 level in November 1954 (303 months). The market index reached a low of 51.39 in February 1933. Roughly 86.5% of market value was destroyed during those 42 months, August 1929 to February 1933. Figure 6 also compares the wealth destruction in the current market decline since the high of 13,930 that occurred during October 2007. During the first 16 months since October 2007, the market fell to 7,063 or a decrease of 49.3%. Through the first 16 months of the Great Depression, the market fell by 56.7%. The fall in the market during first few months was greater in the Great Depression than currently, but the sustained declines in the market during 2008 and early 2009 brought the market to comparable decreases when compared to the Great Depression. However, since February 2009, the cumulative market decline has increased to -33.1%. For comparison purposes, another significant decline known as the dot-com bubble occurred from the high of 11,497 during December 1999 to a low of 7,592 during September 2003. The cumulative market decline from the high was 34.0%. The recovery period for the dot-com bubble was 81 months. The declines in the stock market of the magnitude that we have recently experiences will take years to overcome.

Global Nature of the Decline

The drop in the United States market has been mirrored in stock market indices around the world. Figure 7 examines the performance of the United States (DOW), Argentina (MERVAL), Australia (ASX), Brazil (BOVESPA), France (CAC 4), Germany (DAX), Hong Kong (Hang Seng), Japan (NIKKEI 225), and

⁷ The current unemployment rates are higher than that predicted by the historical relationships.

⁸ Real GDP data are from the Bureau of Economic Analysis, <http://www.bea.gov/national/xls/gdplev.xls>.

⁹ The nominal stock market data are the Dow Jones Industrial Average of 30 stocks reported on the first trading date of the month via <http://finance.yahoo.com/q/hp?s=%5EDJI&a=09&b=1&c=1928&d=02&e=9&f=2009&g=m>.

¹⁰ The unemployment rate data are from the Department of Labor Bureau of Labor Statistics via the Economic Report of the President, <http://www.gpoaccess.gov/eop/2009/B42.xls>.

India (BSE SENSEX) stock indices on a monthly basis beginning in October 2007¹¹. The markets all moved downwards until February 2009, with declines ranging from 41.5% (Brazil) to 59.1% (Hong Kong). Since February 2009 the global markets have generally increased with Argentina, Brazil, and India having declines 25% or less. The monthly correlations with the U.S. markets range from 0.827 (India) to 0.989 (France). Clearly, the wealth destruction that has occurred in the U.S. has also occurred globally.

Linkages between Financial Markets and the Farm Sector

Given the large destruction of global wealth, the question arises as to the potential ramifications for the agricultural sector both in the U.S. and globally? First we examine the relationship between the overall economy and the agricultural sector. Generally, inflation adjusted U.S. agricultural land values (right axis) and the stock market (left axis) have trended together since 1929 (Figure 8)¹². While the series are positively correlated (0.659), there have been periods of time where the series have diverged. For example, the highly inflationary periods in the U.S. during the 1970s and the period afterwards caused a significant divergence between the stock market and agricultural land prices. Figure 9 examines the percentage change in the stock market and agricultural land values during the same period. While the series generally move together, year to year price changes have a low correlation measure (0.161). Additionally, it is clear that stock market returns are much more variable than U.S. agricultural land market returns.

The linkage between the U.S. economy (GDP) and U.S. net farm income is an inverse one, with a correlation of -0.342 (Figure 10)¹³. Thus, low overall inflation adjusted net farm income has tended to occur when the inflation adjusted U.S. GDP was higher. Therefore, based on longer periods of time, the agricultural economy and the general economy have not necessarily moved together. This is further illustrated by examining the relationship between Illinois corn price and the U.S. stock market¹⁴. The monthly percentage change in the U.S. corn price is graphed against the monthly percentage change in the S&P 500 (Figure 11). The correlation between changes in the corn price and the stock market has been 0.002 on a monthly basis since 1960. Therefore, while the general U.S. economy may be slow there appears to be little long term evidence that there will be major spillovers into the U.S. farm economy. In fact, based on history, it is more likely that the agricultural economy and the general economy are inversely related.

While the long term trends are fairly weak based on long-term evidence, a shorter term analysis between the U.S. market and Illinois corn price is presented in Figure 12. Over the last three years, the relationship between an agricultural commodity (corn) and the U.S. stock market has been variable. In 2006, there was a slight positive trend in percentage changes in corn price and the overall stock market. During 2007, the trend was negative with increases in corn prices tending to be associated with decreases in the U.S. stock market. During 2008, the relationship changed again with a stronger upwards trend between percentage changes in the corn price and percentage changes in the overall stock market. Thus,

¹¹ The stock market data for the international markets are reported on the first trading date of the month via <http://finance.yahoo.com>.

¹² The nominal stock market data are the Dow Jones Industrial Average of 30 stocks on the first trading date of the year. The nominal land value data are from the Economic Research Service, USDA at <http://www.ers.usda.gov/Data/FarmIncome/finfidmuxls.htm#farmnos>.

¹³ The information on net farm income was from the Economic Research Service, USDA <http://www.ers.usda.gov/Briefing/FarmIncome/Data/Constant-dollar-table.XLS>.

¹⁴ The corn price is the monthly average corn farm price received in Illinois from the University of Illinois at <http://www.farmdoc.uiuc.edu/manage/pricehistory/excel/corn.xls>. The stock price data are for the S&P 500 on the first trading day of the month from <http://finance.yahoo.com>.

while the overall historical relationship between commodity prices and ultimately income in the U.S. farm sector and the overall macro economy has been weak, it is important to recognize that ultimately what may occur in the short-term may not be representative of the longer term trends during these turbulent economic times.

Given the previous analysis, it is important to understand the current economic health of the agricultural sector. In the U.S., net farm income in 2008 was second only to the all time record high in 2004.¹⁵ This net farm income allowed farmers to adjust their balance sheets and pay down debt. To provide a perspective of the overall health of the farm sector, Figure 13 presents the overall probability of default for Kansas farms from 1973 through 2008¹⁶. The overall financial strength of the sector is as strong as it has been in nearly 20 years, with the average probability of default of 1.84%. During the farm crisis in the 1980s, the probability of default increased to above 3%. Certainly there is some distribution among farms around the probability of default, however, the financial situation is strong not only in Kansas, but in the U.S. in general.

That does not mean however, that there are not some issues on the horizon. The probability of default estimated above is a function of three factors: the leverage ratio, the net working capital ratio, and the capital debt repayment capacity (Featherstone et. al, 2006). Therefore, changes in any of those three factors could quickly change the financial stability of the agricultural sector. Specifically, decreases in land values or decreases in farm income are factors that are most likely to negatively affect (increase) the probability of default. Inflation adjusted land values are 45% above where they were in 2004 (Figure 14)¹⁷. If land values would fall back to more normal levels, the probability of default would increase by 0.54% from land value changes alone.

Certainly, there is some risk of falling land values due to the dramatic increase observed in land values over the last three years built on the expectation of high farm incomes in the foreseeable future. If incomes remain at recent levels, the risk of dramatic declines in land values is mitigated. However, if farm incomes fall dramatically, then certainly there would be the possibility of land value declines. Net farm income projections made by United States Department of Agriculture (USDA) and the Food and Agriculture Policy Research Institute (FAPRI) are shown in Figure 15¹⁸. Each year, USDA and FAPRI make 10 year baseline forecasts for net farm income in addition to a number of other variables. Figure 15 contains both the 2008 and 2009 ten year forecasts to provide some indication of how quickly the baselines can change from year to year. The last year (2018) of the 10-year baseline for 2009 was not graphed. The FAPRI and USDA forecasts made in March and February 2009, respectively, are more pessimistic for the short run but take vastly divergent paths over the longer term. The USDA forecast does not return to the levels of net farm income that occurred during 2008 through the entire period to 2017. However, the FAPRI forecast suggests that while the short term is much more negative, the longer term is more positive than it was in 2008 with incomes surpassing the 2008 level in 2014 and continuing to increase through 2017. The FAPRI forecast for 2009 decreased by 14.7% between March 2008 and

¹⁵ It is interesting to note that the 2007 estimate was revised downward from 86.8 to 71.1 and the 2004 estimate was revised upward from 85.8 to 87.4.

¹⁶ This chart is updated from Featherstone, A.M., M.R. Langemeier, K.J. Haverkamp and Mark Winger. "Credit Scores of Kansas Farms." Presented at the Risk and Profit Conference, Manhattan, Kansas, August 15, 2008, http://www.agmanager.info/events/risk_profit/2008/Papers/9_Featherstone_Credit_Slides.pdf.

¹⁷ Land values in Kansas are from <http://www.nass.usda.gov/ks/landsel.htm> and are updated at <http://www.oznet.ksu.edu/library/agec2/mf1100.pdf>.

¹⁸ FAPRI estimates for U.S. farm income for 2009 is from http://fapri.missouri.edu/outreach/publications/2009/FAPRI_MU_Report_01_09.pdf and from 2008 is from http://fapri.missouri.edu/outreach/publications/2008/FAPRI_MU_Report_03_08.pdf. USDA estimates for 2008 and 2009 are from <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1192>.

March 2009 while the USDA forecast fell by 10.0% between February 2008 and 2009. The FAPRI forecasts in 2009 only remain below the 2008 levels for 2009 and 2010 and then are as much as 13.2% higher for 2017. In contrast, the USDA forecasts remain between 8.1% and 13.5% less than the 2008 forecasts for the entire period. Clearly, uncertainty exists regarding future net farm income, thus clouding forecasts of the future health of the agricultural sector.

Agricultural Credit Conditions

The other remaining uncertainty that could influence the future health of the sector is interest rates. Agricultural interest rates have generally decreased since the third quarter of 2006 (Figure 16)¹⁹. The Kansas City Federal Reserve Bank's quarterly survey of interest rates shows that during the second quarter of 2009, real estate loan rates (long-term rates) were 6.64% while operating loan interest rates (short-term rates) were 6.92%. The current rates are as low as or lower than any time period in the last 20 years. Certainly, a dramatic run up in interest rates due to either perceived increased risk in the agricultural sector or due to increases in the costs of funds in the general economy could adversely affect farm income and land values. However, in the near term, given the Federal Reserve System's focus on the recession and the current health and stability of the farm sector, it is unlikely that agricultural interest rates will dramatically increase.

One of the results of the turbulence in the overall economy was the lack of available credit. However, the agricultural sector in the U.S. has not experienced a dramatic tightening of credit. The 10th District Federal Reserve Bank in Kansas City has conducted a quarterly survey of agricultural credit conditions since 1980²⁰. For example, the survey asks bankers to respond to whether loan demand during the current quarter was higher than, lower than, or the same as in the year earlier period. The index numbers are computed by subtracting the percent of bankers that respond lower from the percent that respond higher and then adding 100. Numbers above 100 indicate stronger conditions, while numbers below 100 indicate weaker conditions. Information is provided on availability of loan demand and funds available for lending (Figure 17). Loan demand by farmers during the second quarter in 2009 was at a level of 98. The first two quarters of 2009 were lower than they had been since 2003 indicating that on the whole, bankers indicate a slightly lower demand for loans than a year previously. The fall in the index level for the demand for agricultural credit is likely a good sign as farmers begin to adjust their investment plans downward to reflect the uncertainty of future income prospects. Figure 17 also provides information on the supply of available funds for agricultural credit. The index level for the supply of funds was at 110 for the second quarter during 2009. The index rose during the first half of 2009. Available credit increased from the previous year. Thus, the agricultural credit market continues to be unaffected by the liquidity crisis that has plagued the rest of the economy.

The Kansas City Federal Reserve Bank also surveys for information on loan repayments and loan collateral requirements using the same process as described above. The average loan repayment was lower in the second quarter 2009 than it was during the second quarter 2008, with an index value of 92 (Figure 18). The repayment index fell substantially from its level of 132 during the first quarter of 2008. However, the index is still much higher than it was from 1998 through 2003. In addition, an index of collateral required for loans has been available since 1990. The required collateral for agricultural loans increased during the last three quarters from those of a year ago. There has only been one quarter in the observed 20 year period where the index was at a higher level than what it was during the first quarter of 2009. Thus, there is an indication of tightening of underwriting standards over the last year.

¹⁹ Agricultural interest rates are from the Kansas City Federal Reserve Bank, http://www.kc.frb.org/Agcrsurv/InterestRates_KC.xls.

²⁰ The information on credit conditions are from the Kansas City Federal Reserve Bank, http://www.kc.frb.org/Agcrsurv/CreditConditions_KC.xls.

To summarize, credit is available for good credit risks. Certainly, the underwriting standards have increased in order to obtain that credit, but farmers with good repayment histories and fairly strong balance sheets are able to obtain the credit they need. Borrowers should expect to be required to put up more collateral going forward than in the past. Borrowers of marginal credit quality in the past may see more difficulty in obtaining credit in 2010 than in the past. In addition, there likely will be larger differences in interest rates among borrowers than in the past. In some respects, the lack of opportunities to make loans in other sectors of the U.S. economy has benefited the agricultural sector given its relative strength.

Global Effects on Farm Income

U.S. agriculture has been reliant on trade. According to the Foreign Agricultural Service, U.S. exports reached an all time high in 2008 of \$115.5 billion (Figure 19)²¹. Although agricultural imports were also at a record high of \$79.3 billion, the trade surplus was a record \$36.1 billion. USDA projects that for 2009, agricultural exports will decline by 14.7% to \$98.5 billion. The agricultural trade surplus is also expected to decline by 51.5% to \$17.5 billion. It has been argued that the previous two busts in the agricultural land market in the U.S. were in part caused by a softening of global demand for U.S. agricultural products (Featherstone and Baker, 1987). As projected by USDA, a global recession could weaken U.S. farm exports. For example, the size of the reduction is likely to differ between grains and meat products. Meat is more income elastic than grain. Therefore, with a global recession, meat trade likely will be affected more negatively than grain production. Specifically, those commodities that are more discretionary in a consumer's market basket are likely to feel the effects of a downturn more quickly. While the farm economy may not feel large effects overall, certainly there are some agricultural producers that will feel the effects from the financial market turmoil more than others. A reduction in agricultural exports may lead to a building of commodity surpluses (stocks) and a reduction in crop prices and ultimately net farm income.

The OECD examined the impact of the credit crisis on agricultural trade and found that "trade credit constraints are affecting the agri-food sector and, in a number of instances, quite severely" (p.46). They found that the regardless of the position in the food chain or whether they were exporters or importers, trade finance constraints to the business were important. In some cases, trade would only take place on a basis dramatically affecting the movement of agricultural goods globally.

One of the factors that will affect agricultural trade is the exchange rate. As the U.S. dollar strengthens, agricultural exports become relatively more expensive leading to a decline in U.S. exports. Figure 20 provides a historical view of the trade-weighted exchange rate for the U.S. dollar²². The index is weighted by individual currency trade weights for the 26 largest trading partners (Loretan). Since February 2002 when the index reached an all-time high of 129.5, the index fell by 23.9% to 95.5 through April of 2008. The dollar began to strengthen until March 2009 when the index reached a level of 112.5. Since then the dollar has weakened slightly. The current levels of the dollar are slightly higher than the levels of 2008 when U.S. agricultural exports were at a record high level. However, the dollar is not so strong to substantially affect agricultural exports.

A possible mitigating factor for any trade effect is the extent to which the corn-based ethanol industry will be a buffer to lower commodity prices. Certainly, the increased farm incomes in 2007 and 2008 were in

²¹ The trade chart is from the Foreign Agricultural Service, USDA at <http://www.fas.usda.gov/cmp/outlook/2008/Nov-08/Nov08.ppt>.

²² The trade weighted exchange index is from the Board of Governors of the Federal Reserve System via the St. Louis Federal Reserve Bank, <http://research.stlouisfed.org/fred2/fredgraph/>.

part due to the rapid increase in ethanol production in the U.S. The increased prices of agricultural commodities combined with a decrease in oil prices have put the U.S. ethanol industry at risk. Figure 21 reports simulated ethanol profits for a 100 million gallon Iowa ethanol facility²³. The total costs of producing ethanol increased rapidly during the first half of 2008. During the second half of 2008, the cost of producing ethanol decreased rapidly with the decline in corn price. However, the revenue per gallon of ethanol also decreased as the price of oil decreased leaving little profit in the industry. The ethanol industry returned to profitability during June and July of 2009 with the decrease in costs of producing ethanol. While the profitability of the sector is low, it is important to consider the U.S. mandates for renewable fuels. This may mitigate the potential of large price decreases for commodities.

Input Market and the Rural Economy Effects

The turbulence in the global market has had a limited effect on the U.S. agricultural economy through the middle of 2009. Credit conditions are such that there is not an immediate concern that agricultural inputs will not be used due to lack of credit. The more immediate issue is the effect on farm input markets due to an expected reduction in farm profitability in 2009 and beyond. Figure 22 illustrates nitrogen use with the inflation adjusted nitrogen price from 1960 through 2007²⁴. The correlation between the inflation adjusted price and consumption is -0.617. Nitrogen consumption has generally increased over the period, while the inflation adjusted price has generally trended downwards. The variability of nitrogen use has been less than the variability in price, indicating the inelastic nature of nitrogen demand. Thus, nitrogen price changes are unlikely to affect the demand for nitrogen thereby mitigating the effects of instability in the general overall economy.

Inflation adjusted expenditures on purchased inputs such as seed, fuel, and all fertilizer are examined to understand the variability of use over time and to understand whether major changes in the use of these inputs occurred during the Great Depression (Figure 23).²⁵ During the Great Depression era, inflation adjusted expenditures on fuel did not drop. There was a drop in fertilizer expenditures of 45.8% and seed expenditures of 28.1%. Thus there is some evidence that if economic conditions became very difficult, there may be a substantial drop for some inputs. However, if we look at more recent information, the variability in expenses is low from year to year. Thus, recent evidence would suggest that changes in the farm economy due to changes in the overall economy do not affect the use of purchased inputs substantially. Figure 22 also documents the large increase in production expenses that occurred since 2006 with inflation adjusted seed, fuel, and fertilizer expenses increasing by 31%, 36%, and 61% over the two year period.

One of the other major inputs in production agriculture is farm machinery (Figure 24)²⁶. Credit availability issues are likely to affect purchases of agricultural machinery more than other types of farm inputs because of the longer time period of financing for machinery assets. Generally, the quantity of agricultural machinery purchased has decreased when the inflation adjusted machinery price increased. The correlation between the two series is -0.691. In general, the quantity of machinery used adjusts slowly and does appear to adjust quickly to year to year swings in machinery prices.

²³ The information on simulated ethanol plant profits is from Don Hofstrand, Iowa State University, <http://www.extension.iastate.edu/agdm/articles/hof/HofJan08.html>.

²⁴ The nitrogen use and the nominal nitrogen price index are from the Economic Research Service, USDA, <http://www.ers.usda.gov/Data/FertilizerUse/Tables/FertilizerUse.xls>.

²⁵ Fertilizer use, purchased seed use, and fuel use are all from the Economic Research Service, USDA at <http://www.ers.usda.gov/data/FarmIncome/Expense/expagprd-1.XLS>.

²⁶ Farm machinery indexes of prices and input use are from the Economic Report of the President, <http://www.gpoaccess.gov/eop/2009/B101.xls> and <http://www.gpoaccess.gov/eop/2009/B100.xls>, respectively.

The rural economy will also be affected by the turbulence in the financial markets. It appears that the effects coming from agriculture will mostly be from decreases in farm income and not due to a collapse in agricultural land values or a rapid loss of banking assets in the rural economy, thereby mitigating the effects on the rural economy. A dollar of lost gross farm leads to a value added income loss of 0.45 cents to the rest of the economy (Golden et. al. 2009). The rural economy likely will see a larger impact through the loss of jobs in the nonagricultural economy than due to changes in net farm income in the agricultural economy.

Conclusions

The effects from the financial crisis in the U.S. have been felt in economies around the globe. What started as a housing market bubble in the U.S., and which many argued could be contained has spread to other industries and other countries. The decline in the U.S. stock market and many other equity markets around the world approached a 50% drop in 17 months. A decline of this magnitude has not occurred since the Great Depression in the United States. The effects of this decline have affected consumer confidence and have increased the unemployment rate in the U.S. The real economic activity in the U.S. has declined for four quarters with a total decrease of 3.9%. Whether the decline in consumer confidence will lead to greater decreases in aggregate demand that would lead to further economic problems is unclear at this point. While many nonagricultural firms have experienced the credit crisis, this has not yet occurred to a large extent in the agricultural economy.

The general economy market effects are more likely to affect the agricultural sector through lower profitability due to the demand destruction that has occurred globally. As countries face recession, aggregate demand for agricultural commodities will decline, especially for those commodities that are more discretionary in a consumer's market basket. As such, agricultural trade will be reduced. In addition, the trading patterns around the globe are beginning to be affected. With the strengthening of the U.S. dollar, U.S. agricultural commodities have become relatively more expensive causing them to be less competitive globally.

While the impacts have not been large to this point on the agricultural economy in the U.S., the effects in the agricultural sectors of other countries may be more severe. The availability of credit from country to country will vary, with some farmers in different countries seeing little change and others facing extremely tight credit markets. In the U.S., farmers are entering the recession in a very strong financial position. Although under certain adverse conditions, that strong financial position could deteriorate in a couple of years. Early warning signals of a rapid deterioration will be observed in the agricultural land market in addition to the profitability of the agricultural sector.

Examining economic data through the Great Depression does provide some information regarding potential agricultural economy impacts. Some agricultural input markets certainly will be more susceptible than others. For example, fertilizer use in the Great Depression declined roughly 50% and purchased seed use declined roughly 25%. However, fuel use did not decline. Thus, differential effects are certainly possible in farm input markets.

The remaining issue is how long before some stability occurs in the overall global economy. While many analysts would like to rely on econometric models to answer the question, the magnitude of the turbulence certainly stretches many economic models beyond their statistical confidence levels. In some respects, the situation in the housing market is like the situation that occurred in the agricultural economy in the early 1980s. Many of the same mistakes in the current housing crisis were made by market participants in the farm financial crisis of that time. The farm crisis essentially took five years to work through, much of that coinciding with the decline in agricultural land values. Currently, housing values have declined for more than three years in the U.S. To reach longer term trend values, housing prices

may need to decline by another 1% indicating we may be approaching the bottom of the housing market in the U.S. However, it is important to remember that the agricultural farm crisis was contained to essentially that sector alone, while the housing crisis has spread to the overall economy. Therefore, while there are some similarities between the housing/credit crisis today with the farm crisis in the 1980s, there are some important differences that could lead to the effects being more severe.

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Figure 1. U.S. Housing Price Index and 90 Day Nonperforming Loan Percentage

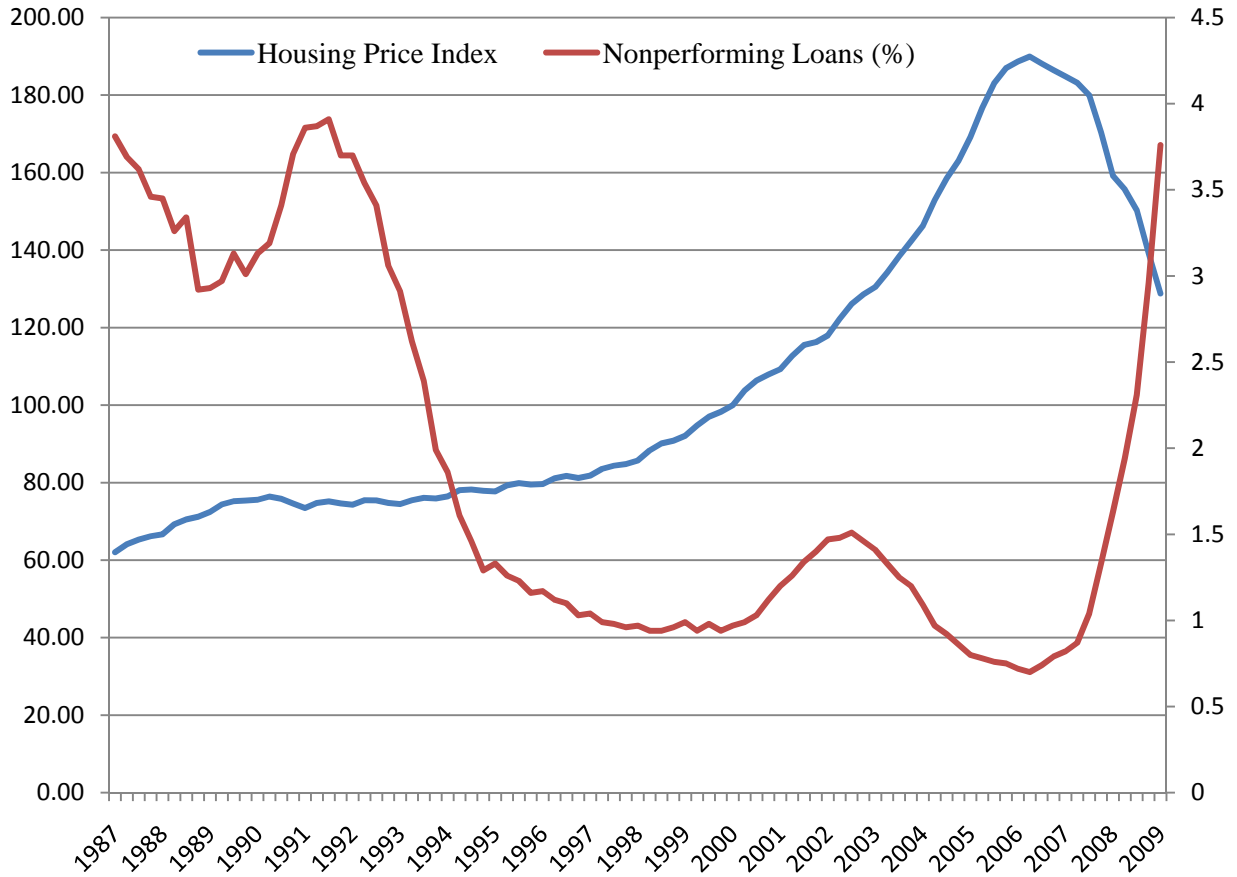
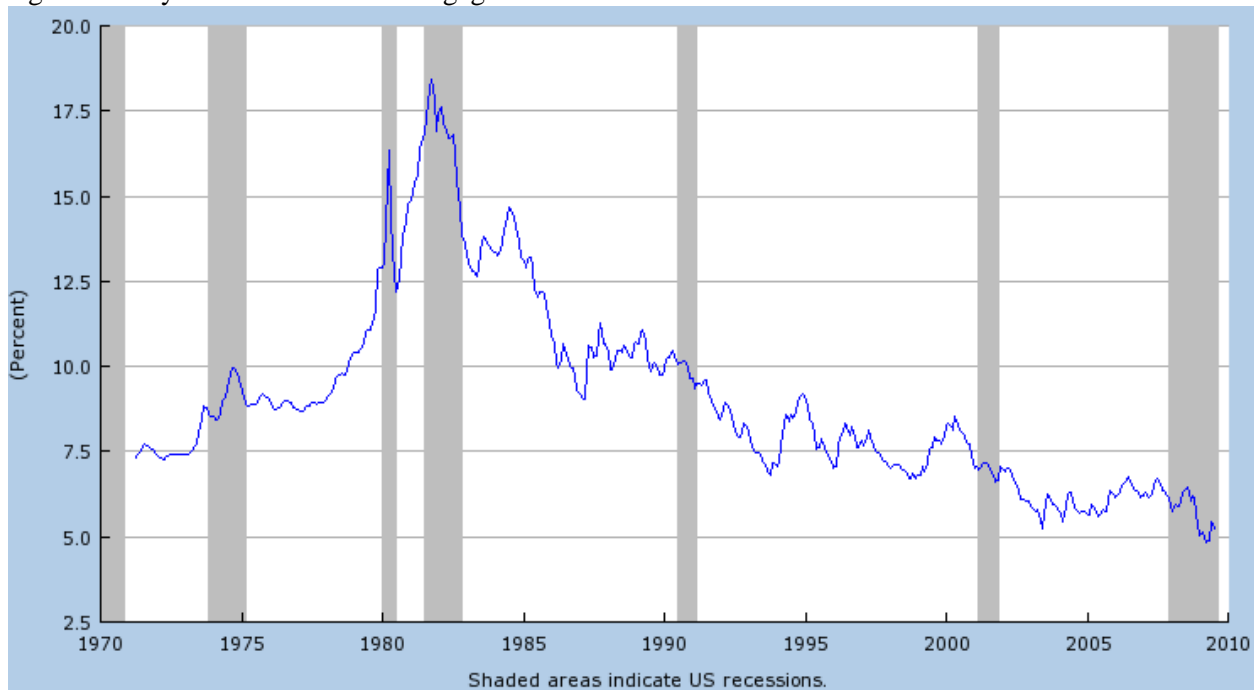


Figure 2. 30 year Conventional Mortgage Interest Rates



Source: Board of Governors of the Federal Reserve System, St. Louis Federal Reserve Bank

Figure 3. U.S. Consumer Confidence and the Unemployment Rate, 1978 – 2009

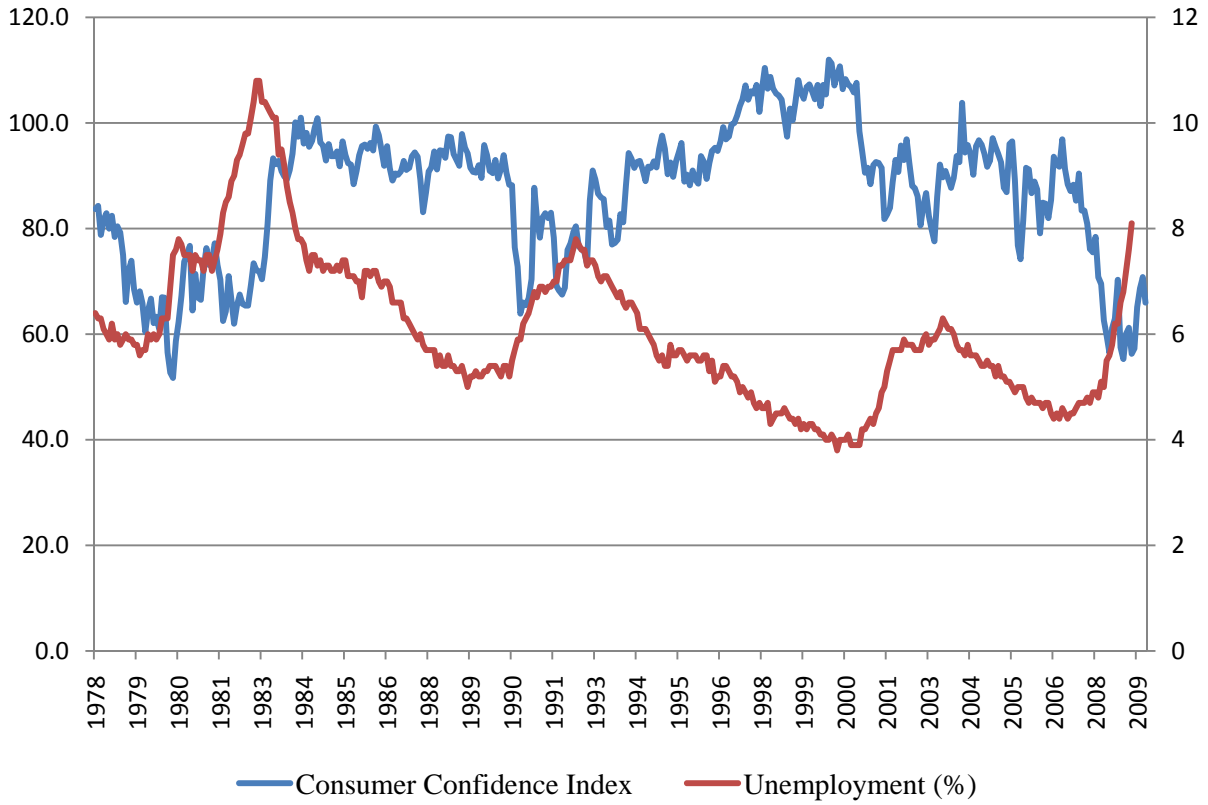


Figure 4. Inflation Adjusted GDP and the Dow, 1929 – 2008

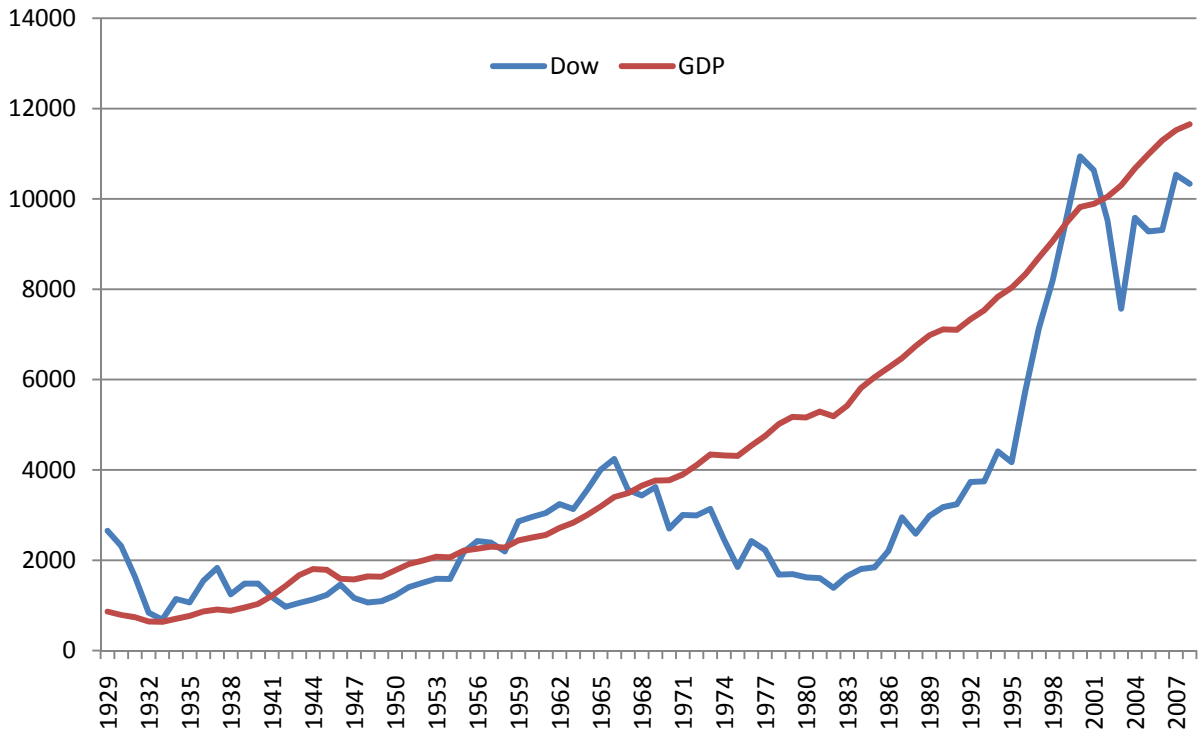


Figure 5. Annual U.S. Unemployment Rates, 1929 – 2008

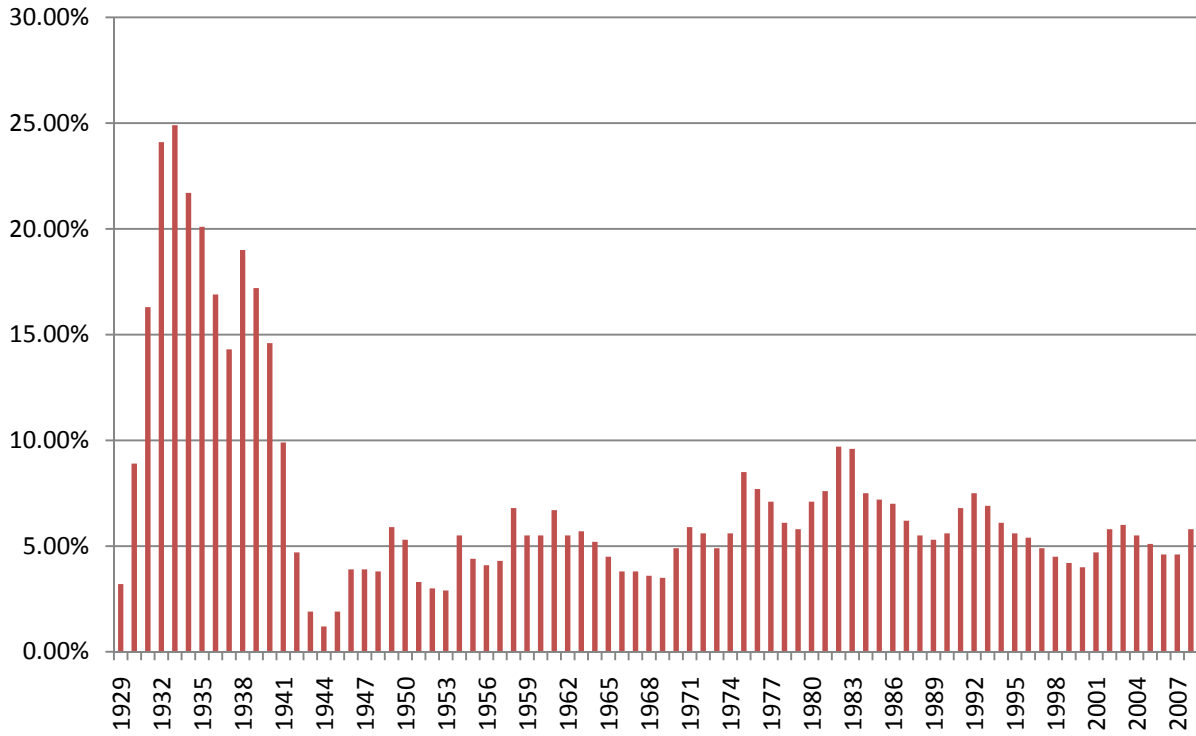


Figure 6. Comparison of Dow Jones Market Declines from August 1929, December 1999, and from October 2007

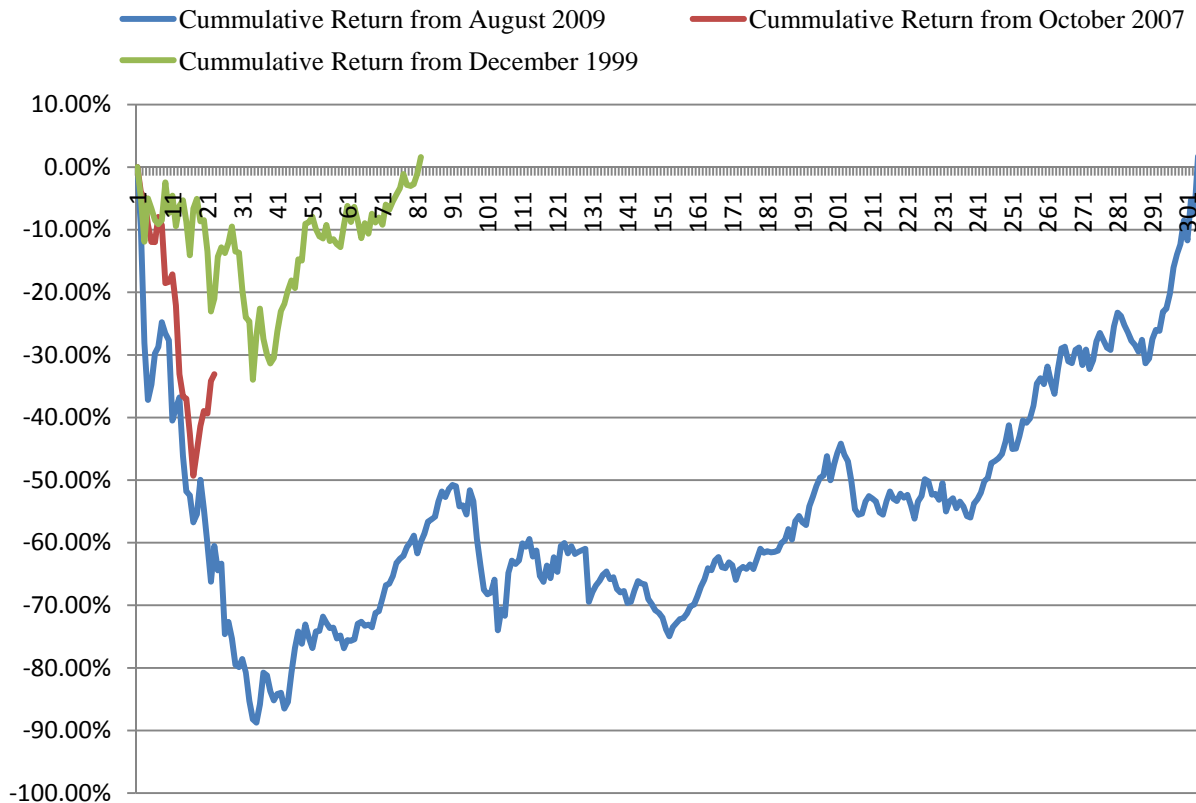


Figure 7. Global Stock Exchange Performance since October 2007

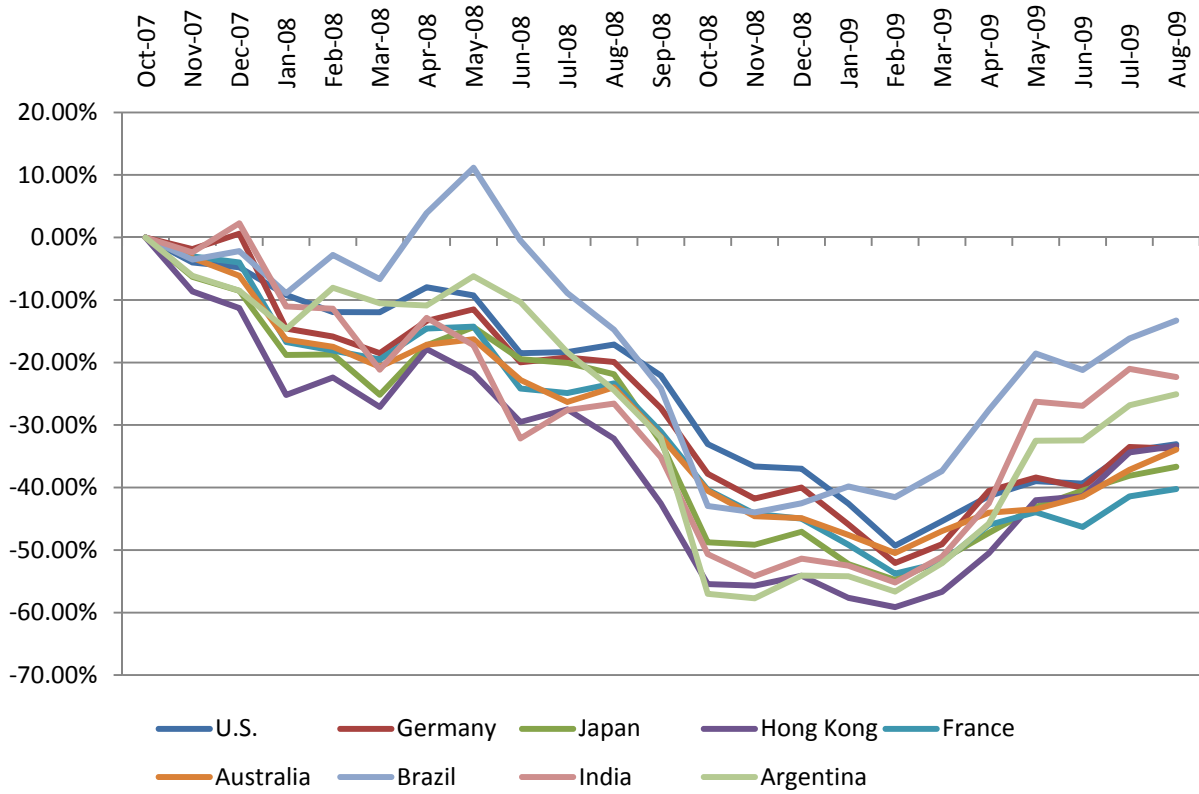


Figure 8. Inflation Adjusted Farm Land Prices and Stock Market Returns, 1929 – 2008

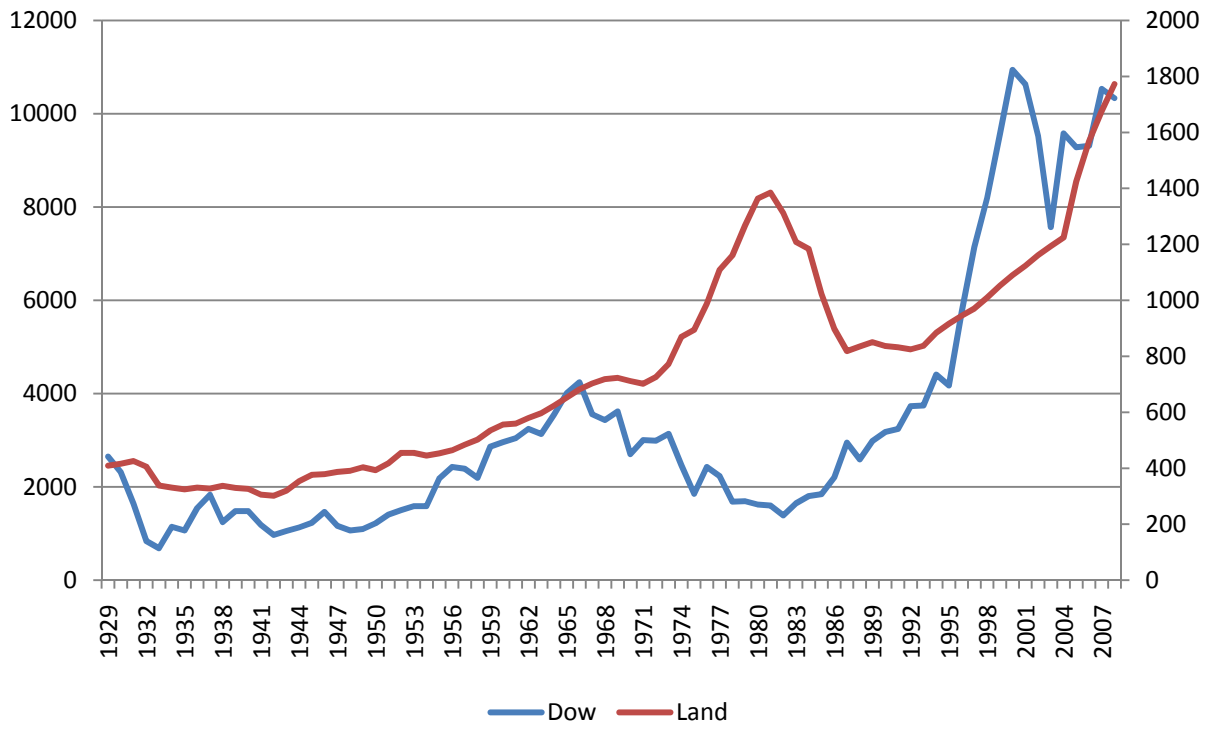


Figure 9. Percentage Change in U.S. Agricultural Land Values and Stock Market Indices, 1930 – 2008

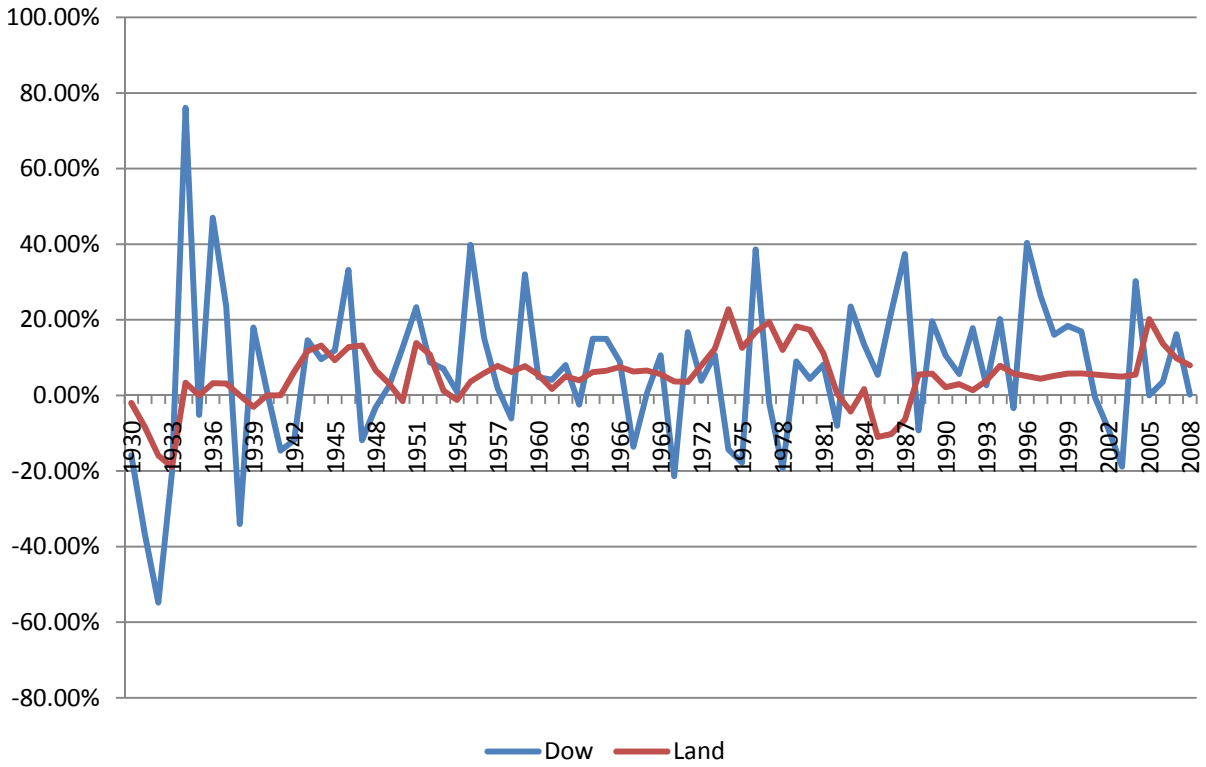


Figure 10. Inflation Adjusted U.S. GDP and U.S. Net Farm Income, 1945 – 2008

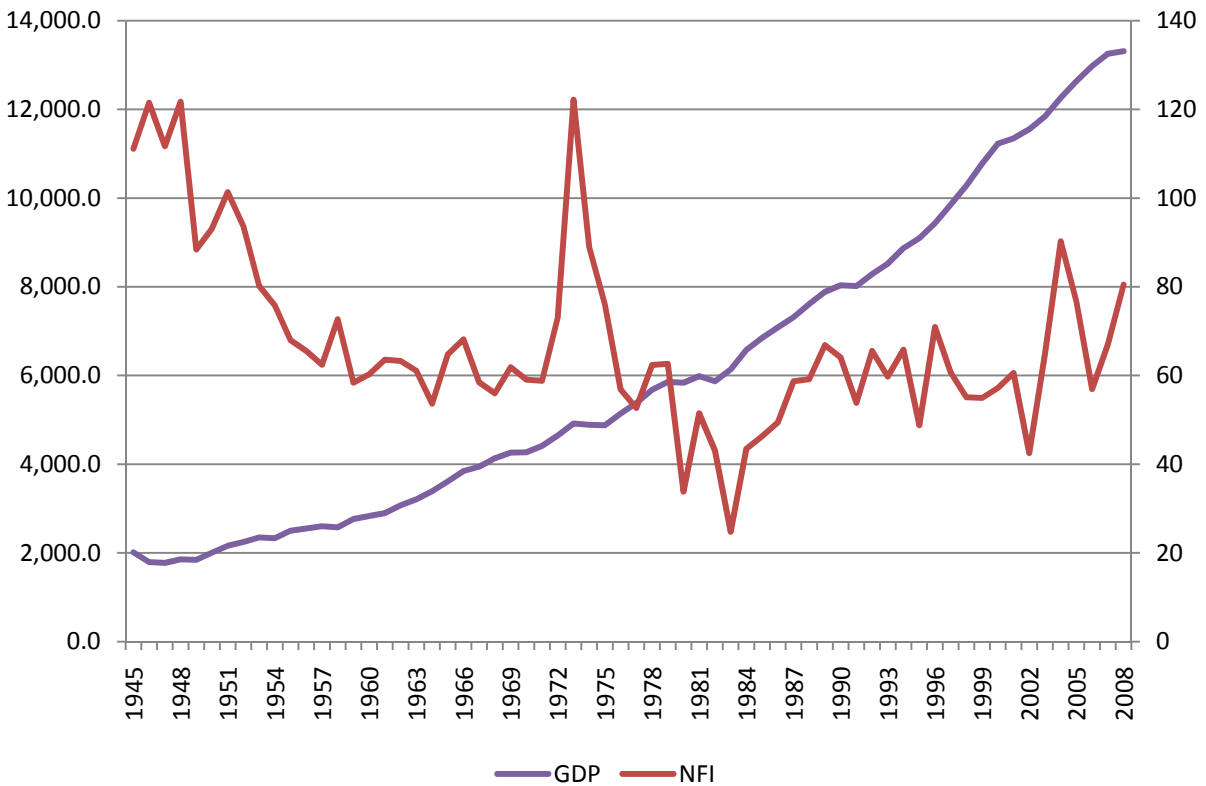


Figure 11. Monthly Percentage Price Changes in Corn Price and the S&P 500, 1960 – 2008

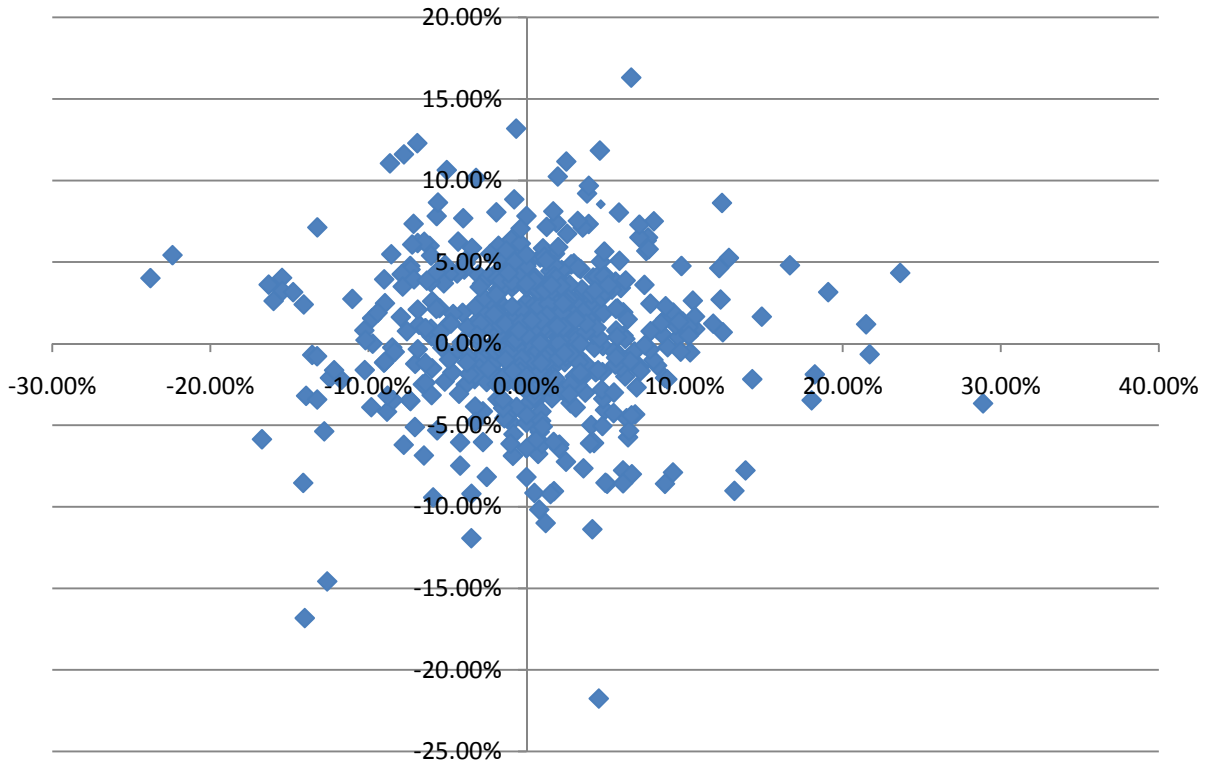


Figure 12. Monthly Percentage Price Changes in Corn Price and the S&P 500, 2006 – 2008

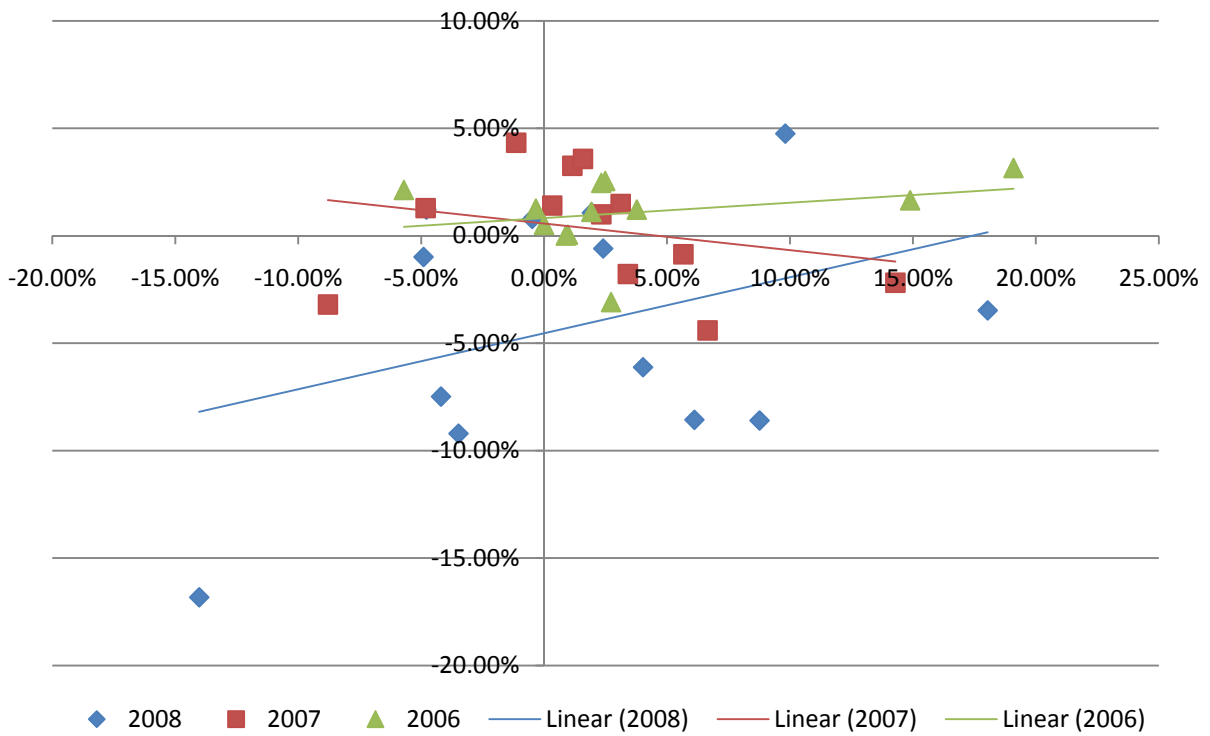


Figure 13. Probability of Default for Kansas Farms, 1973 – 2008

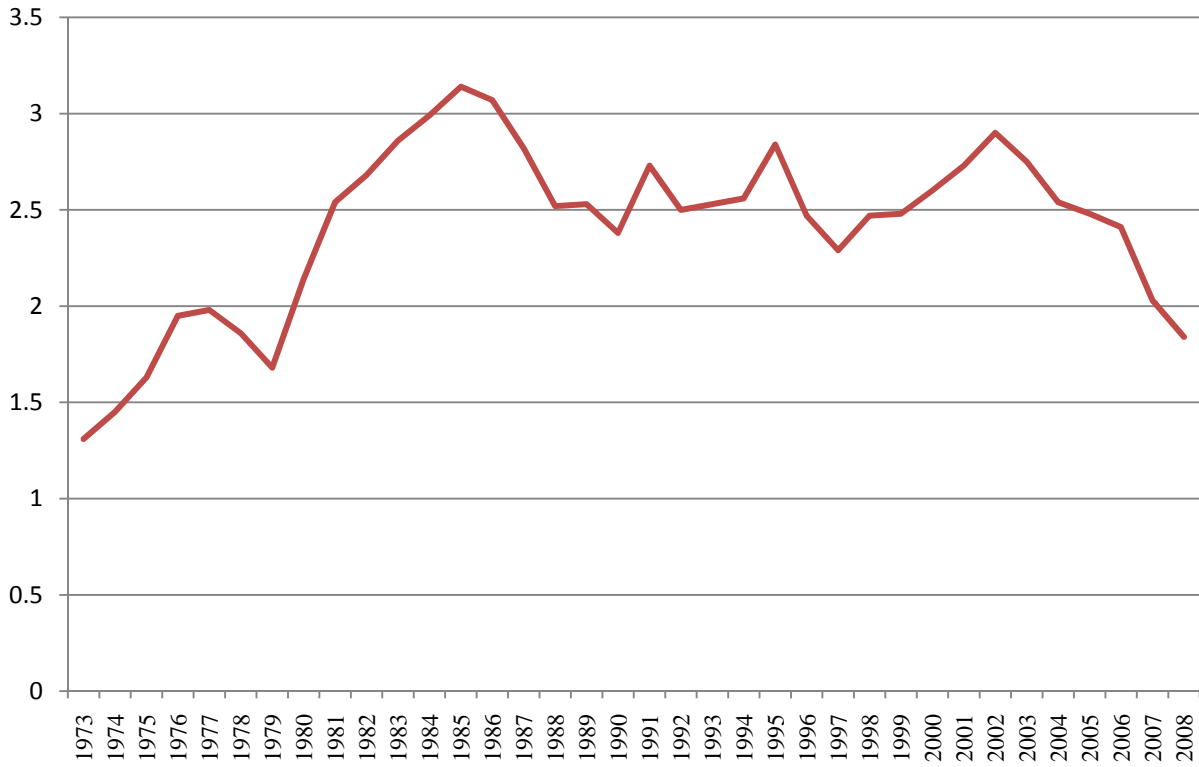


Figure 14. Inflation Adjusted Kansas Land Prices, 1950 – 2008

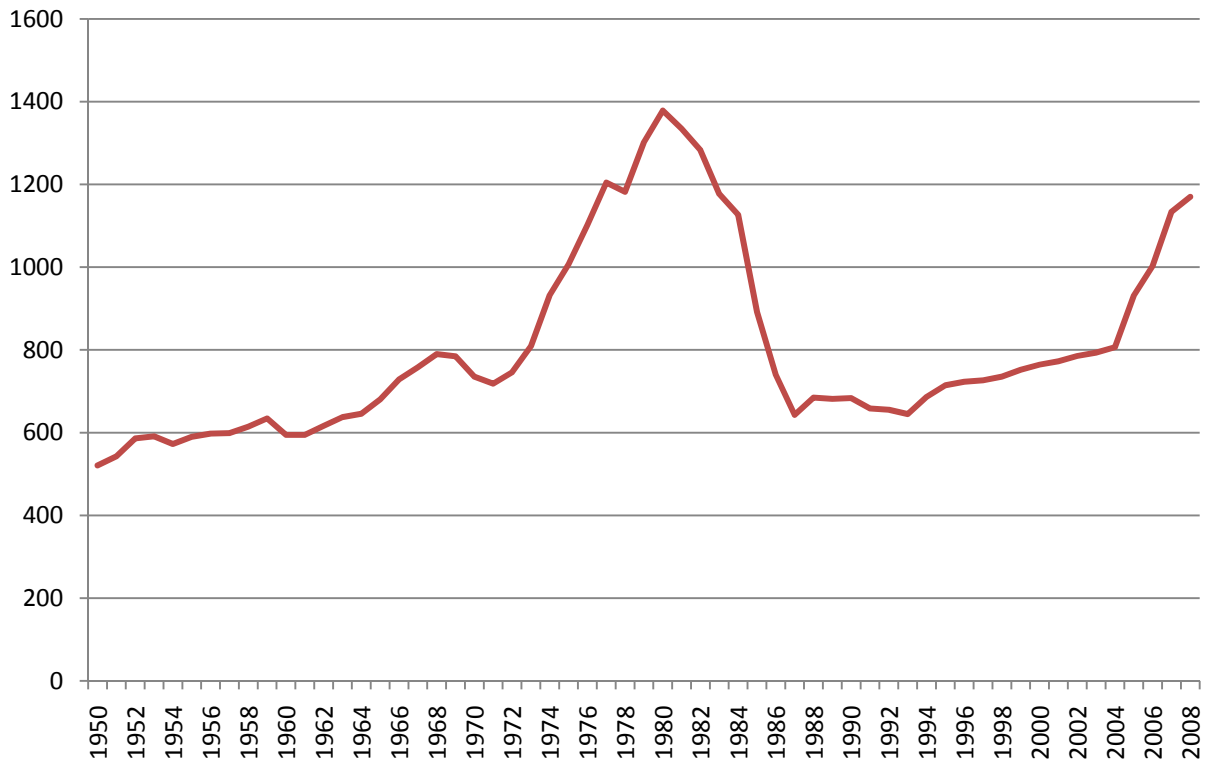


Figure 15. Historical U.S. Net Farm Income with USDA and FAPRI Baselines for 2008 and 2009

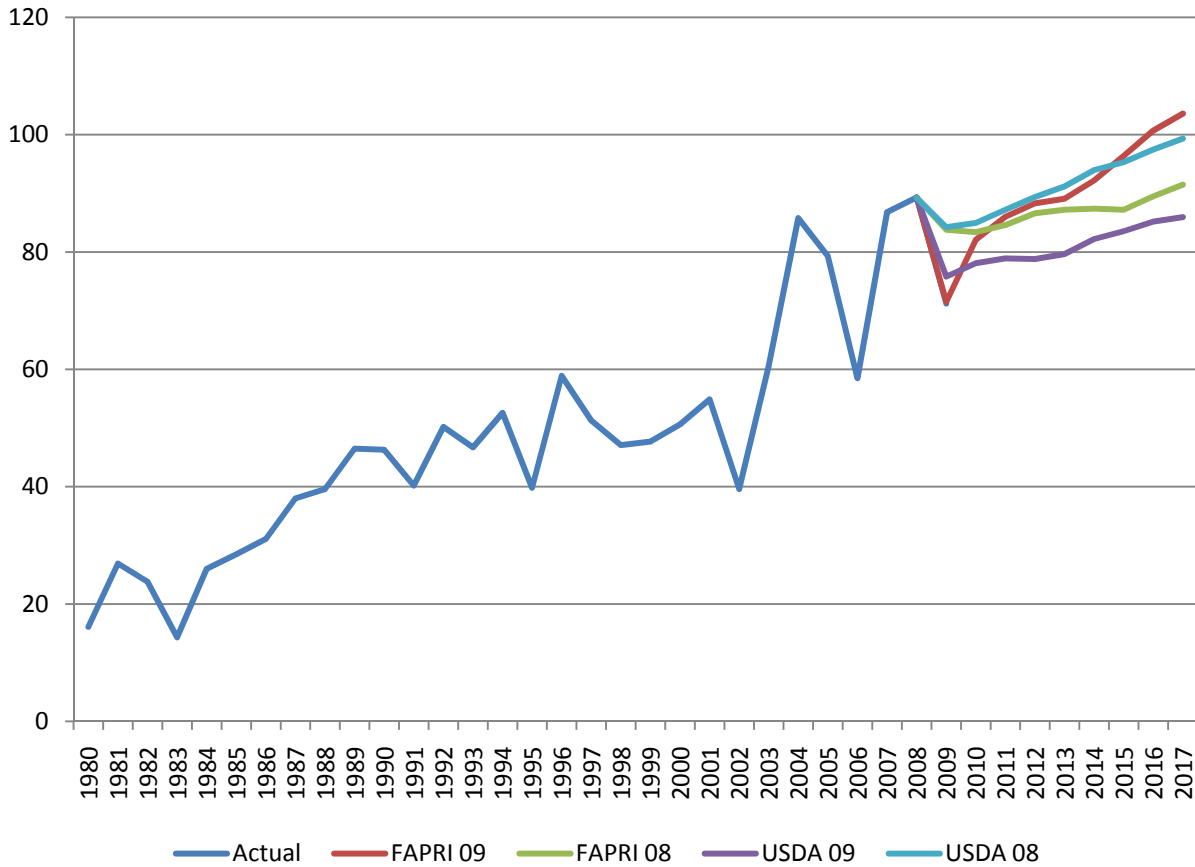


Figure 16. Quarterly Real Estate and Operating Loan Interest Rates Tenth District Federal Reserve Bank

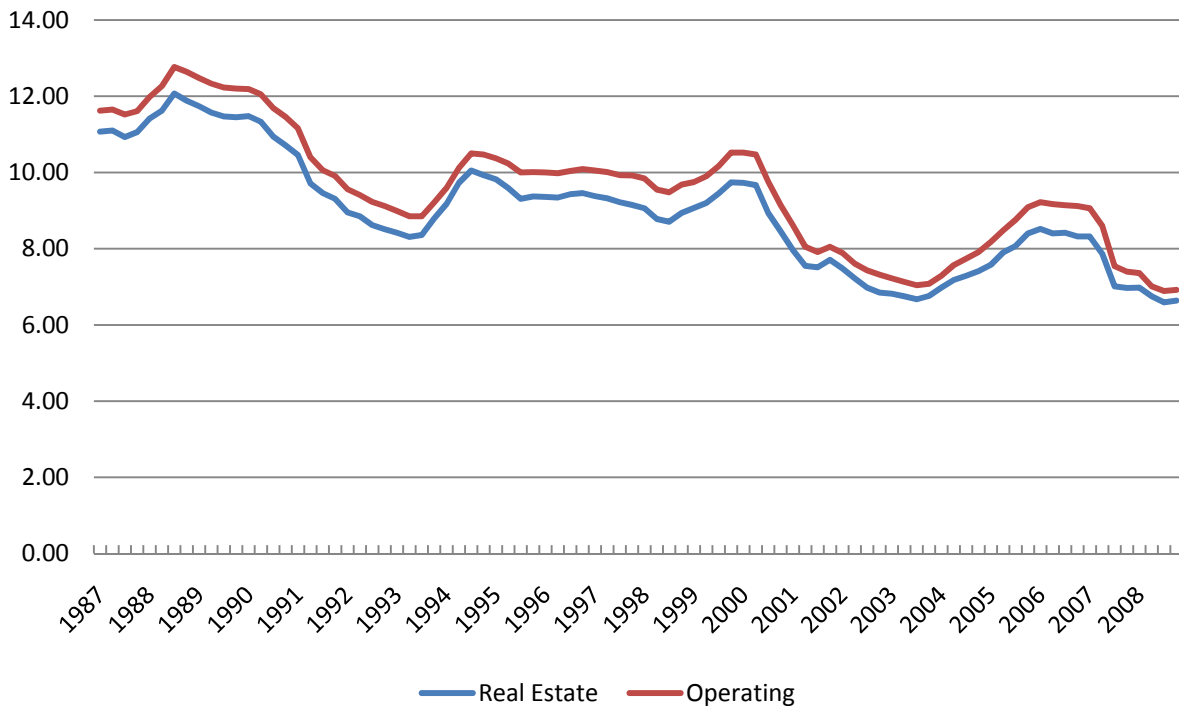


Figure 17. Index of Agricultural Loan Demand and Available Funds in the 10th Federal Reserve District

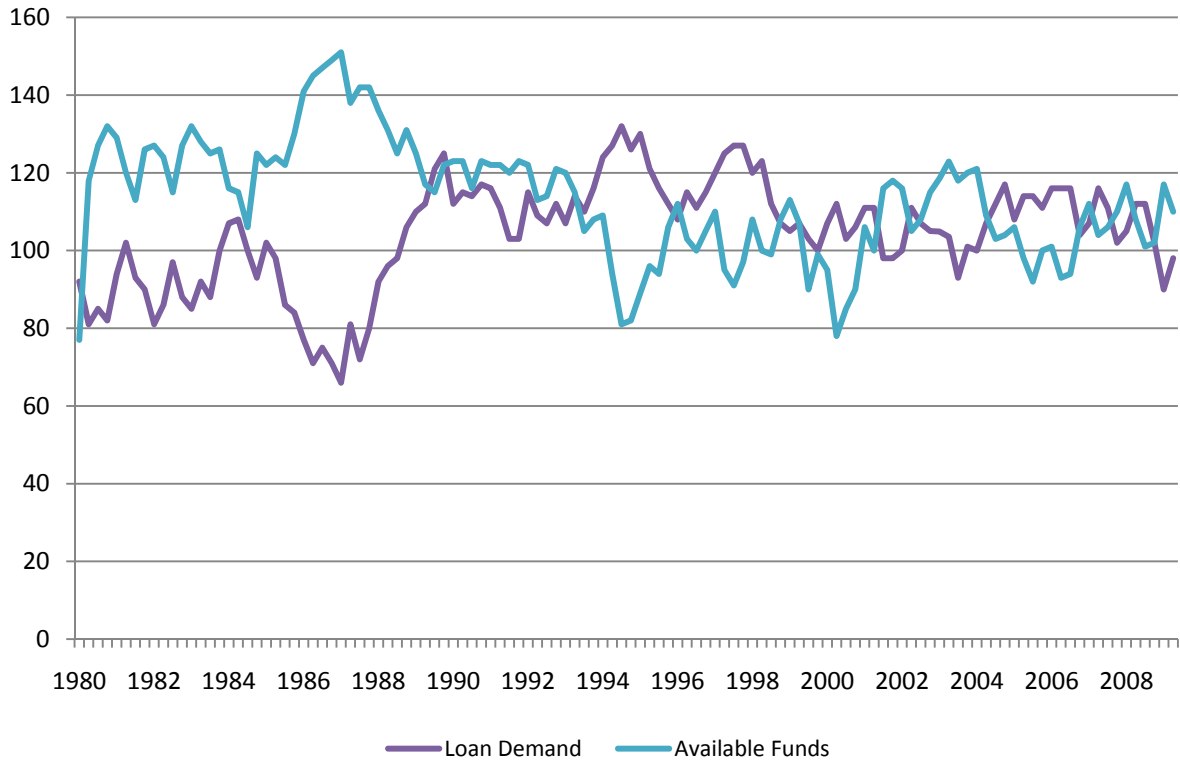


Figure 18. Index of Agricultural Loan Repayment and Collateral Requirements in the 10th Federal Reserve District

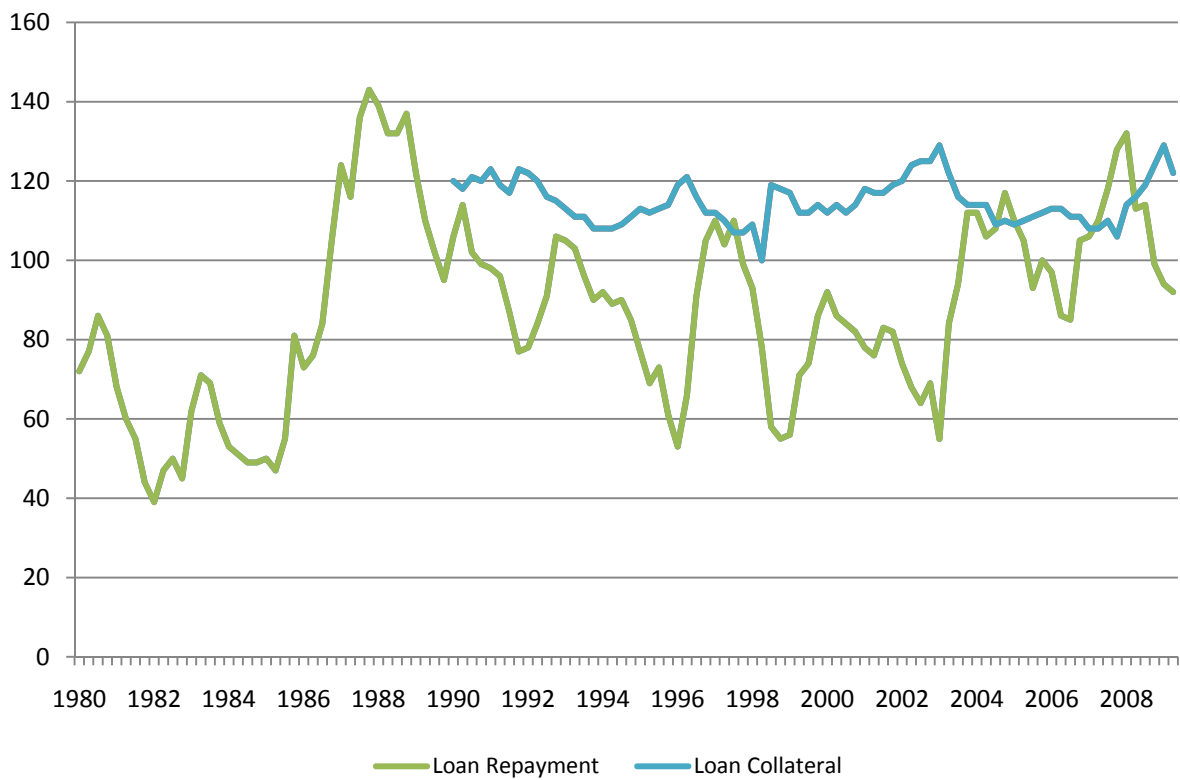
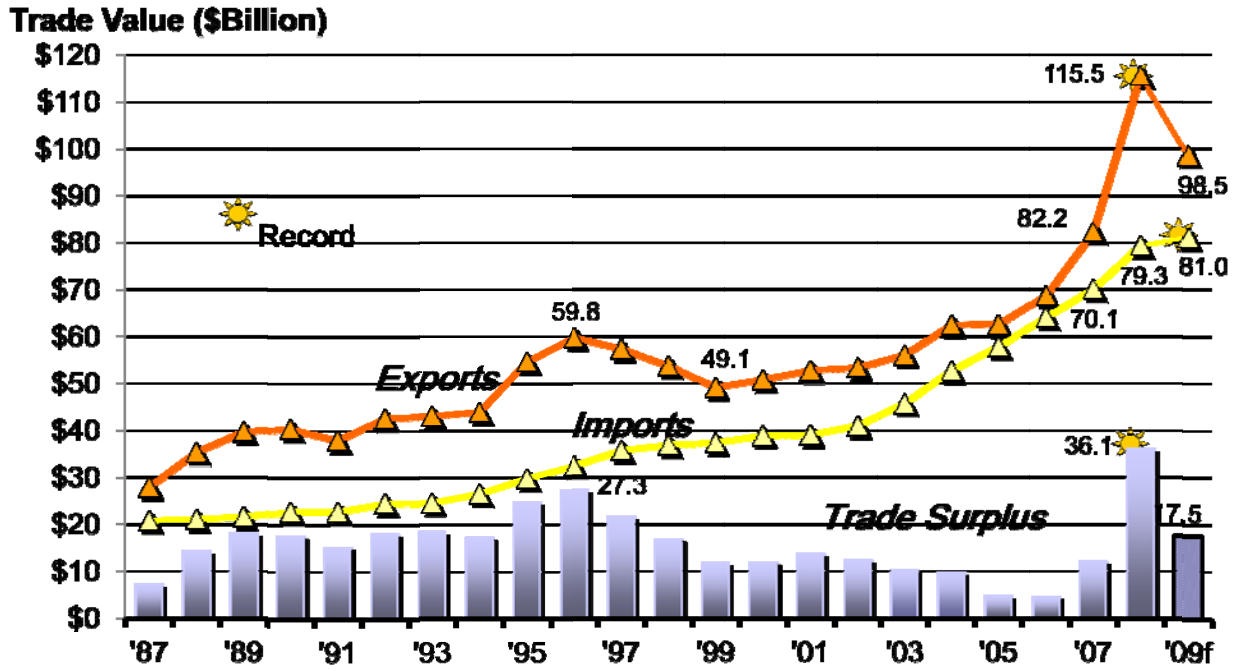


Figure 19. U.S. Agricultural Imports and Exports 1987-2008



Source: Foreign Agricultural Service, USDA <http://www.fas.usda.gov/cmp/outlook/2008/Nov-08/Nov08.ppt>

Figure 20. Trade Weighted U.S. Dollar Exchange Index, January 1973 through July 2009

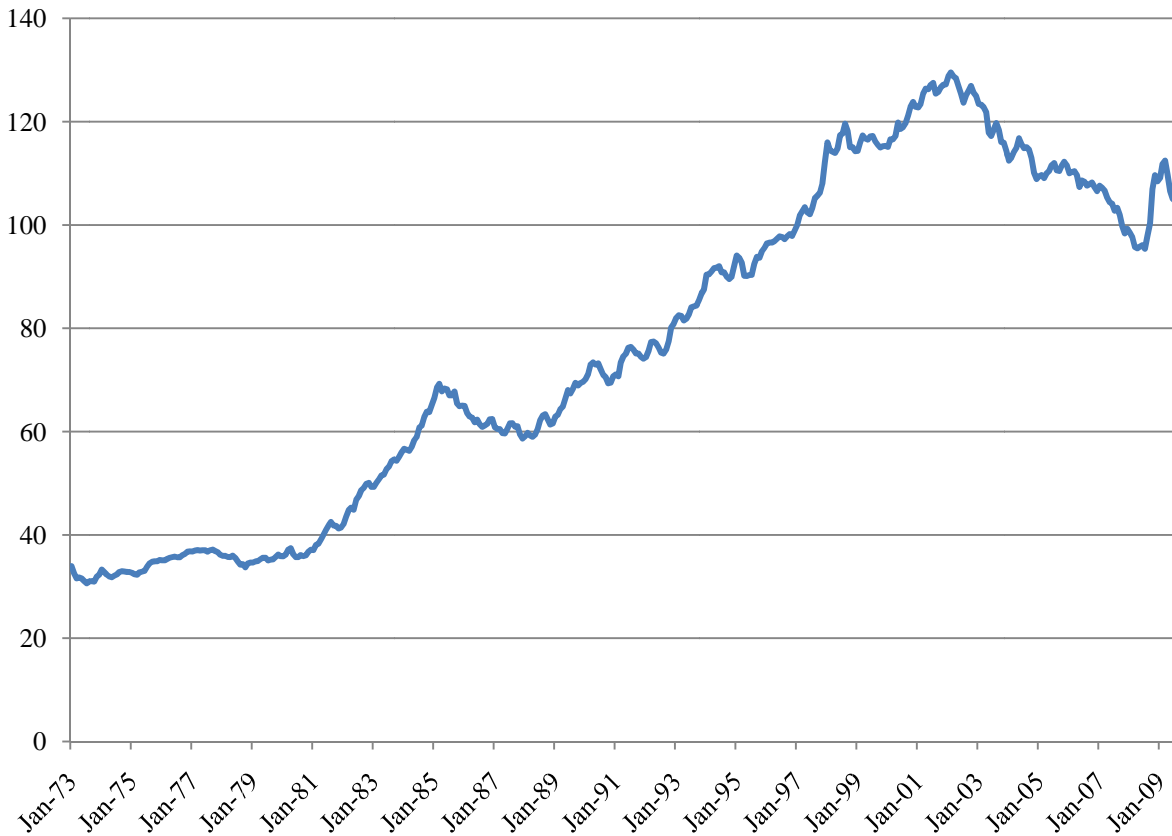
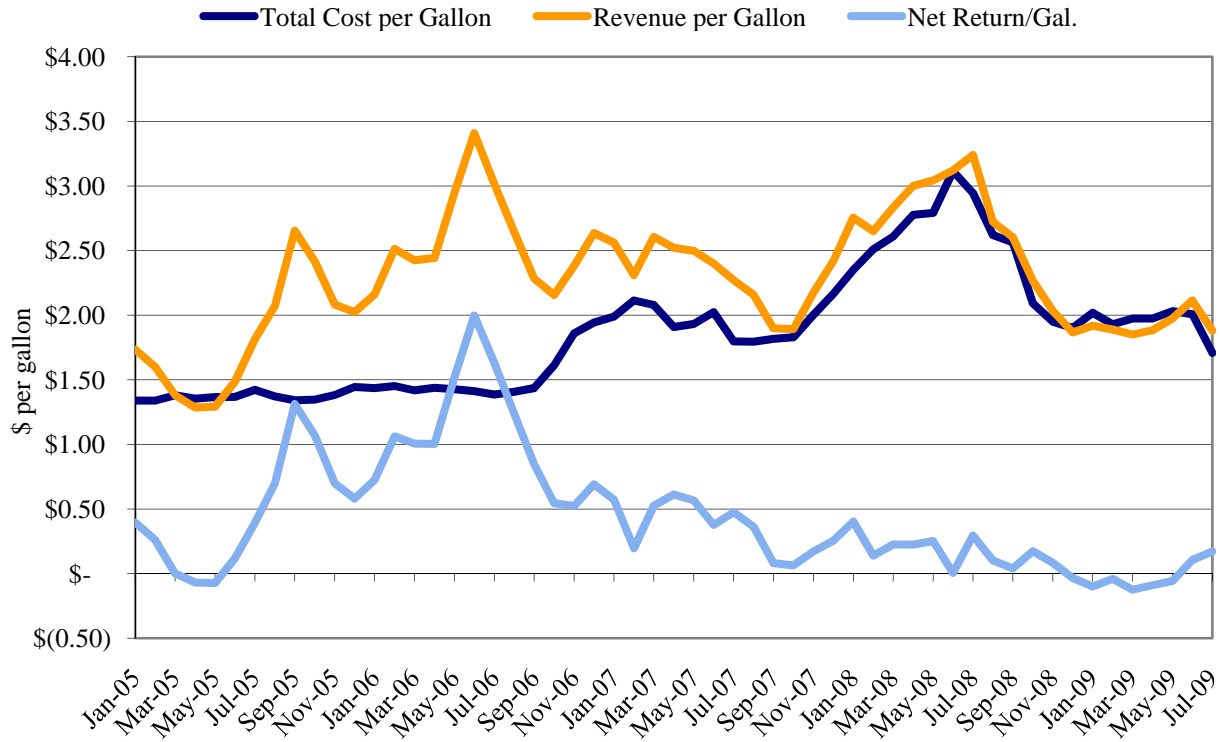


Figure 21. Monthly Estimated Ethanol Revenue, Cost, and Profit, January 2005 – July 2009



Source: Don Hofstrand, Iowa State University, <http://www.extension.iastate.edu/agdm/articles/hof/HofJan08.html>

Figure 22. U.S. Nitrogen Consumption and Inflation Adjusted Price, 1960 – 2007

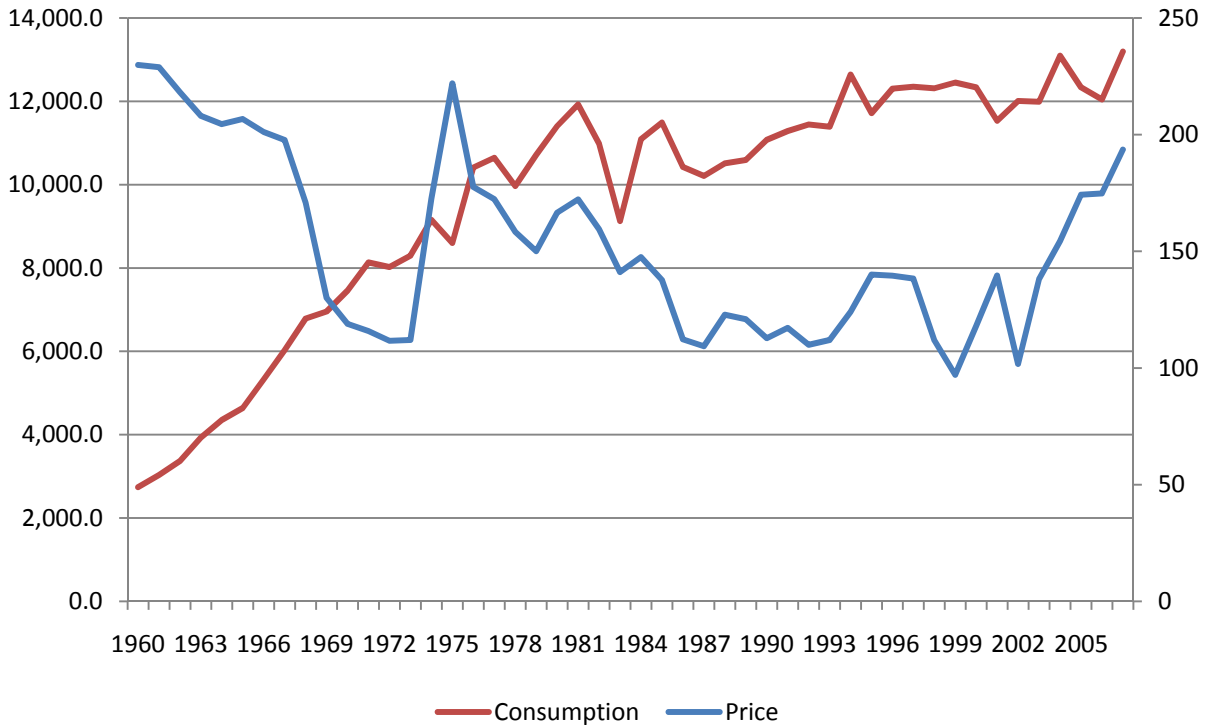


Figure 23. U.S. Inflation Adjusted Fuel, Fertilizer, and Seed Expenses, 1929 – 2008

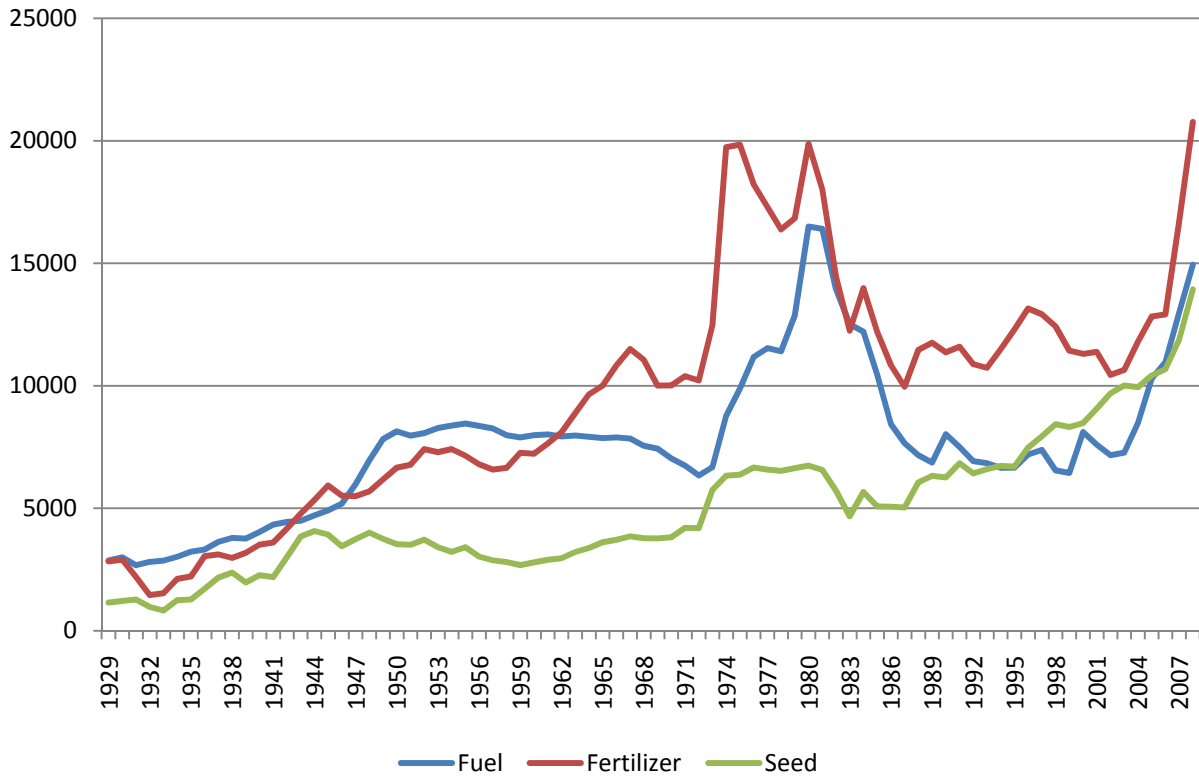


Figure 24. U.S. Farm Machinery Investment and Price, 1948 – 2007

