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Credit as a Factor Influencing Farmland Values

Jerome M. Stam

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Credit as a Factor Influencing Farmland Values. By Jerome M. Stam. Rural Economy Division, Economic Research Service, U.S. Department of Agriculture. Staff Paper No. AGES 9504.

Abstract

The latest farmland boom-bust cycle of the 1970's and 1980's caused agricultural economists to search for an adequate explanation. Some viewed the excessive use of mortgage credit by the farm sector as a major contributor to the boom in farmland prices above what the farm sector's earnings picture would support. A look at the literature on factors determining farmland values, speculative farmland price bubbles, and the role of farm mortgage credit yields a remarkable lack of consensus. Some agricultural economists attributed the 1970's farmland price boom to excessive use of mortgage credit by farmers. However, there exists no general agreement among them as to one primary cause.

Keywords: Credit, debt, farm finance, land values, farmland.

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Contents

CREDIT AS A FACTOR INFLUENCING FARMLAND VALUES

Jerome M. Stam*

Introduction

The purpose of this monograph is to examine and place into perspective the agricultural economics literature regarding the influence of credit usage on the market for farmland. The article briefly summarizes the numerous research efforts to explain farmland values, looks at more recent research on speculative land price bubbles, and examines the literature on the role of credit in inducing the 1970's farmland price boom. Agriculture has evolved into one of the more capital-intensive sectors of the U.S. economy and is significantly dependent on debt financing.

Farm real estate--valued at $682 billion in 1994--comprises about three-fourths of all wealth held by the U.S. farm sector. Farm real estate is not only a productive asset but is also an important source of loan collateral. The latest Economic Research Service (ERS) farmland transfer data show that 4.6 percent of parcels and 3.5 percent of the rural land acreage transferred hands in 1989. USDA data for 1993, the most current, show that debt was incurred on 60 percent of farmland transfers. Debt was 72 percent of the purchase price on debt-financed transfers, and institutional lenders extended some 70 percent of the credit used in purchasing farmland that year. Total farm business real estate debt was $77.2 billion at yearend 1994.

For decades, agricultural economists were conditioned to expect a close relationship between farm income and land values. Farmland prices fell from a post-World War I high of $69 per acre in 1920 to a Great Depression low of $30 per acre in 1933. Per acre farmland values then slowly increased in most subsequent years, but it was 1951 before the $74 per acre value exceeded that of 1920. The result was three decades (1920's to early 1950's) of relatively close correlation between farm income and land values that verified the residual theory of rent (Chryst). Agricultural economists believed that land values were positively related to movements in gross farm income and, conversely, if gross farm income remained steady, land values should remain steady.

During the 1950's, per acre farmland value increases began to accelerate even during years when farm income was steady to lower, thus putting to the test long-held theories. Researchers at first were puzzled by this paradox but they eventually came to recognize that their earlier perspective had been too narrow (Scofield). Their tendency to limit their analyses to those economic forces operating within the farm sector had hampered a fuller understanding of past and current trends. Subsequent efforts proceeded to explain farmland price changes on the basis of broader economic trends and uses of land originating outside the farm sector. It was recognized that earlier assumptions were oversimplified and that value judgments affecting the farmland market were handled inadequately.

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Per acre farmland values kept trending upward during the 1960's, but, buoyed by a number of factors, such as an export boom, they skyrocketed during the 1970's and early 1980's. From 1970 to the 1982 peak, U.S. farmland value per acre jumped 319.9 percent compared with a rise in the implicit price deflator of 138.1 percent (figure 1). This boom was followed by a 27.2 decline during the 1982-87 period before a slow upward trend resumed.

This strong boom-bust cycle intensified the search for an adequate explanation among researchers. One perspective is that the excessive use of mortgage credit by the farm sector was a major contributor to the boom in farmland prices above what the farm sector's earnings picture would support. It is noted that in 1971 the Farm Credit System's (FCS's) Federal Land Banks (FLB's) were authorized to raise limits on farm real estate loans from 65 percent of the agricultural value to 85 percent of the often higher appraised market value of the security. The effect of this change on the use of FCS credit and the possible impact on farmland values is argued to the present time.

The data show that the rapid rise in the per acre value of U.S. farmland over the 1970-82 period to a 1982 peak value was accompanied by an increase in total farm business real estate loans of 270.1 percent (figure 2). Farm mortgage loans of the FCS were up 580.1 percent and the subsidized real estate loans of the Farmers Home Administration (FmHA) (made a part of the Consolidated Farm Service Agency [CFSA] in 1994) were up 280.6 percent over their 1970 levels. These increases are viewed as evidence by some that farm mortgage credit had been too easy to obtain. The opposing perspective, however, is that lenders and farmers made rational decisions on the use of credit after 1970 based on the prevailing market forces. Moreover, this view maintains that problems arose only when market fundamentals changed radically in the late 1970's and early 1980's.

Explaining Farmland Price Volatility

The relationship between land rents and land commodity prices has been an important issue since the beginning of economics. Ricardo (1772-1823) provided answers for classical economists with his theory of differential rent. During the post World War II era, there has been much concern about rising agricultural land prices and the collapse of these prices in the 1980's. There is thus a long and rich history leading to the modern development of empirical models designed to explain farmland values. Various theoretical analyses and numerous empirical econometric models have been employed to explain farmland values. The research methods differ and the influencing variables, such as credit and debt, thus are considered in various ways. Much research has been conducted on the determinants of farmland prices with sometimes conflicting results. A brief review of this literature provides a perspective on the recent debates concerning speculative land price bubbles and the role of credit in fueling farmland value booms.

Agricultural economists by the late 1950's, were made most aware of the increasing importance of farm capital gains as farmland values continued to rise (Grove). A considerable body of literature arose to explain the discrepancy between agricultural productivity and market values of rural land. Agricultural economists debated the nature of this "supplement" to "normal" farm income and there was a difference of opinion regarding

Figure 1--Index of Average Nominal Value Per Acre of U.S. Farm Real Estate (48 States) Compared with the Index of the Gross Domestic Product (GDP) Implicit Price Deflator, 1970-94 (1970=100)

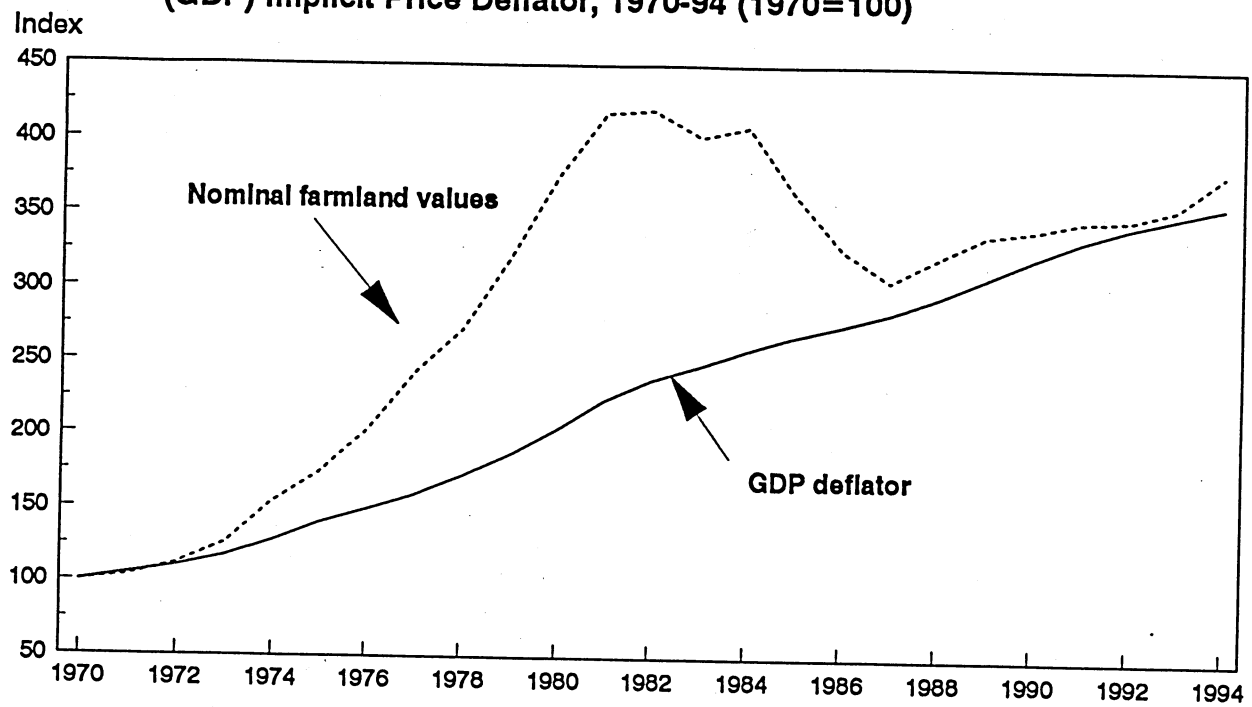
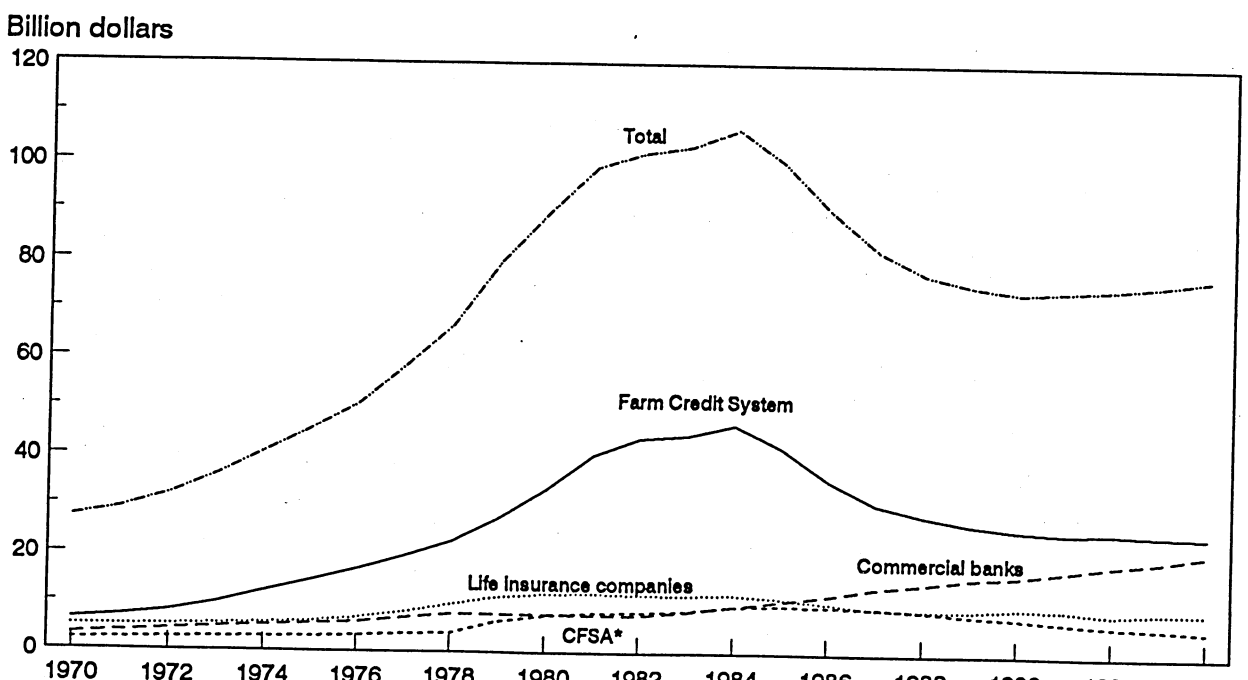


Figure 2--Real Estate Farm Business Debt, by Lender, 1970-94



Farm Credit System CFSA* Life Insurance Companies Commercial Banks Total

*The Farmers Home Administration (FmHA) was merged into the new Consolidated Farm Service Agency (CFSA) in 1994.

the desirability of lumping capital gains and losses with ordinary income. Some felt this "supplement" was paper profits based on values obtained through the operation of a thin land market. A number of estimates of farm capital gains and losses were made, but they differed in scope, method, and concept. Hathaway (1957) and Grove (1960) computed nominal capital gains, and Hoover (1962) and Boyne (1964) corrected their estimates for purchasing power.

Herdt and Cochrane (1966) addressed the seemingly contradictory situation of rising agricultural land prices and relatively constant income per acre. Among other researchers, Tweeten and Martin (1966) conducted work in an effort to determine if farmland prices were too high relative to income and, thus, were out of equilibrium. They felt that alternative hypotheses must be advanced to explain farmland price changes because net income did not explain the land price spiral that had its roots beginning in the 1950's. Reynolds and Timmons (1969) found that for the 1933-65 time period much of the variation in land prices could be explained by expected capital gains, predicted voluntary transfers of farmland, government payments for land diversion, conservation payments, farm enlargement, and the rate of return on common stock.

Crowley (1974) reviewed the income-capitalization formula, its underlying assumptions, and the reasons why this formula understated the actual capitalization rate in periods of rising farmland values or rents. He developed a revised income-capitalization formula that enabled the user to include the impact of changes in expected rents or property value on (1) the rate of return on an investment and (2) the price the purchaser could afford to pay for a particular property. Crowley also correctly identified net rent as a key predictor of the actual rate of return on a farmland investment. Other analysts prior to this and some afterward used a gross measure such as net farm income to predict the unit value of price per acre. But income is a return to all factors of production while net rent is related to the land factor.

In 1979, Pope et al. conducted an evaluation of earlier econometric models of U.S. farmland prices. They reestimated the earlier work by Herdt and Cochrane, Reynolds and Timmons, and Tweeten and Martin that used a simultaneous equation framework. They found that these models all did a reasonable job of explaining farmland prices during the periods for which they were originally estimated, but performed poorly when models were applied to more recent data. In short, the econometric models of the 1960's were inappropriate to explain the divergence between farm income and land values in the 1970's (Shalit and Schmitz, p. 710).

Melichar (1979) examined the magnitude and causes of farm asset appreciation. He developed a capital asset pricing (CAP) model to show that the farm sector with rapid growth in real current return to assets would tend to experience large annual capital gains and a low rate of current return to assets. Capital gains can result from a growing stream of net rents. Melichar claimed that comparing farm income and farmland prices is incorrect. Instead, analysts should compare real capital gains from farm assets with the current return from those assets. The research by Melichar and others led to a common acceptance of the relationship between cash rents and land values. A fundamental assumption common to the subsequent land values literature is that the value of the land is equal to the discounted present values of returns expected from the land. One measure of the return attributed to land is the rent a tenant would pay to acquire control of the land.

The CAP model used by Melichar also was utilized in a number of other studies of the determinants of farm real estate values by the mid-1980's. Examples of this included the work of Barry (1980), Brown and Brown (1984), and Boehlje and Griffin (1979). Central to the CAP model is the allowance of a future income stream to be translated into a current value. The CAP model requires the price of an asset to equal the discounted value of all expected future cash flows. It forms an appropriate beginning point for explaining the value of assets such as farm real estate. However, missing from most CAP studies of farmland values is the consideration that there is more than one group competing for farmland. Many CAP studies focus on farmland as a production input and ignore demand from other sources for residential use or as an investment alternative based on current farm income or for eventual conversion to nonfarm uses.

Castle and Hoch (1982) demonstrated that farm real estate price involves important components in addition to the capitalized value of rent for the services of land and buildings used in farm production. They developed an expectations model for farm real estate prices for the 1920-78 period. They found that capitalized rent explained only about half of real estate values during both the 1970's and over the longer 1920-78 period. The remainder was explained by the capitalization of capital gains, including real gains or losses from price level changes. Castle and Hoch were criticized for attempting to explain land prices in terms of expected net rents and expected capital gains as though these two components of land price determination are distinct from one another (Falk, p. 2). Although it is possible that capital gains are driven by speculative forces or by forces unrelated to rents, capital gains can also result from a growing stream of net rents.

J.T. Scott (1983) analyzed factors affecting farmland price decline. The peak in farmland prices in the cash grain region of the Midwest occurred in some areas as early as 1978, and in late 1980 for most areas. The decline began in earnest during the last half 1981 and continued to the subsequent trough. Thus by 1983 agricultural economists were accounting for the new realities in the farmland market in much of the Nation.

Phipps (1984) analyzed the theoretical and empirical relationship between farm-based residual returns, the opportunity cost of farmland, and farmland prices. Temporal hypotheses concerning the source of land price movements were tested using a variant of Granger causality. In the aggregate, farmland prices were found to be unidirectionally "caused" by residual farm-based returns. The findings supported the hypothesis that farmland prices are determined mainly within the farm sector and lend credence to the use of extrapolative expectations processes in structural farmland price models.

Belongia (1985) analyzed factors behind the rise and fall of farmland prices. He noted that the price of farmland generally has followed the roller coaster of expectations about inflation and income from farming. The influences of these expectations were assessed in conjunction with other factors that affect the demand for farmland as an input to farm production. A simple model of land prices was constructed based on variables that were expected to influence the net returns to land used in farming and the returns and costs of holding land as an investment. The results of estimating a statistical model derived from these arguments showed that expected inflation and expected growth in real net returns to farm production were significant factors in determining the rate of increase in land values during the 1970's.

Even with the subsequent sharp reductions in expected returns, however, the model did not explain the rapid decline in farmland values since 1981. A likely reason for this failure, when contrasted with the model's in-sample performance, is error in the measurement of expectations concerning the future paths of inflation, returns, and the real interest rate.

Robison et al. (1985) conducted a study focusing on the relationship between agricultural and nonagricultural land markets. A firm-level land valuation model was developed which depended on the expected growth rate in net cash returns to land, inflation expectations, and property, income, and capital gains taxes. It was then aggregated to obtain an aggregate two-sector land valuation model. That model was then estimated for 24 individual States for the 1960-81 period. In addition, a pooled cross-sectional regression model was estimated combining the 24-State data. The model results demonstrated that significant State differences exist in the land market and, in many States, agricultural land values are influenced by nonagricultural demand for land.

Alston (1986) analyzed growth of U.S. farmland prices for the 1963-82 period. He noted that increases in expected inflation or real growth in net rental income to land have been proposed as alternative explanations of the dramatic real growth in U.S. farmland prices in the 1970's. Alston's research showed the effect of inflation to be theoretically ambiguous. An empirical analysis using U.S. and international farmland prices suggested that most real land price growth can be explained by real growth in net rental income to land. Increases in expected inflation had a negative effect on real land prices, but the effect of inflation was comparatively small. Like Melichar (1979), he assumed that net rents were expected to grow at a constant rate.

Burt (1986) developed an econometric model of the capitalization formula to explain the dynamic behavior in farmland prices. A second-order rational distributed lag on net crop-share rents received by landlords captured the dynamic movements of land prices and performed well in conditional post-sample forecasts. The adjustment path of land prices in response to a perturbation in rents was a protracted dampened cycle. The implicitly estimated tax-free capitalization rate in rent associated with equilibrium land prices was 4.0 percent. Neither the expected rate of inflation nor an exponential trend on rent expectations had a significant effect on land prices.

There are thus a significant number of farmland value studies that made contributions to the literature. The literature includes an impressive list of factors that help determine farmland prices. These include inflation, farm income, government payments, capital gains, net rent, alternative investment opportunities, transfers of farmland, farm enlargement, rate of return on common stock, credit availability and terms, farm debt levels, commodity prices, input prices, yields, taxes, risk, nonfarm returns to land, nonfarm income, foreign buyers, and technological advance. It is easy to see from this nonexhaustive list why it is difficult to sort out the impacts of financial variables, such as credit, debt, interest rates, and related variables in determining farmland prices.

In a review of the research on farmland value determination, Robison and Koenig (1992) concluded the most remarkable feature about these studies is their lack of consensus (p. 212). Clark et al. (1993) examined the relationships that exist between farm income, land values,

and capital asset pricing theory. Using two commonly referenced data sets, they showed that land prices and land rents do not have the same time-series representations, a necessary condition for the simple capital asset pricing theory to hold. This suggested that a fundamental rethinking of the way in which land prices are viewed and modeled is needed. More complex models that allow for rational bubbles, risk aversion, and future shifts in government policy or commodity prices may be required in the view of Clark et al.

Rational Land Market Versus Speculative Bubbles

Still another recent theory of farmland values about which researchers disagree is speculative or rational bubbles. A speculative bubble is essentially an overreaction to current price information. During a speculative bubble, farmland owners and prospective buyers incorrectly infer from past experiences the future earnings stream from farmland and, consequently, farmland's future value (Robison and Koenig). Speculative bubbles may cause farmland to be priced differently than its agricultural use value simply because the future is difficult to predict. This is important because some allege that farm mortgage lenders helped provide the credit that fueled a 1970's farmland price speculative bubble. It thus is necessary to specify what is meant by a speculative bubble and examine some of the studies on the topic.

Perfect foresight farm asset value may be defined as the present value of future actual returns. The variance of perfect foresight prices is the theoretical upper bound on market price variability. Market price variation in excess of the theoretical upper bound is defined as price overreaction. Overreaction happens when the market consistently reacts more to information than is justified after the fact. Evidence from both psychology and economic studies of the stock market suggests overreactions may occur in all asset markets (Featherstone and Baker, p. 534). Overreaction, however, is not consistent with the usual assumption of rational economic agents.

A bubble can occur when the actual market price depends positively on its own expected rate of change. Under such conditions, the arbitrary self-fulfilling expectations of price changes may drive actual price changes independently of market fundamentals. Such a situation is termed a price bubble and some market participants are focusing on irrelevant aspects of the information set.

Price overreactions and price bubbles are not mutually exclusive concepts. The concept of a bubble, however, usually means a divergence between the actual market price and market fundamentals over a longer period. Price bubbles arise from three necessary conditions: durability, scarcity, and common beliefs. Farmland is durable and the market for farmland can become subject to common belief. But some analysts question the assumption that it is scarce in the sense that the supply is perfectly inelastic or that it is fixed (Tegene and Kuchler, 1990, pp. 4-5).

Several studies have been conducted in an attempt to see if the 1970's farmland price boom resulted from a bubble. Featherstone and Baker (1987) studied the dynamic response of real farm asset values to changes in net returns and interest rates using vector autoregression for the 1910-85 period. Results showed that a shock in real asset values, real returns to assets, or

real interest rates leads to a process in which real asset values overreact. In the initial period, a reaction to a shock immediately occurs followed by a continued buildup in the asset value for up to 6 years until finally the effect of the one-time, transitory shock begins to die out.

The results suggest a market with a propensity for bubbles. In contrast to Alston (1986), Burt (1986), and Melichar (1979), Featherstone and Baker concluded that net rents cannot explain a substantial share of farmland price changes, suggesting that there may be purely speculative forces in farmland price determination. This work was the first major item raising the question of a speculative bubble in the buildup of farmland prices in the 1970's (Carey, p. 20). The issue of the existence of such bubbles became important in the debate over the next several years.

Tweeten (1986) conducted a study attempting to explain farmland price changes in the 1970's and 1980's. He concluded that the farmland market is reasonably efficient, and the bursting of a speculative bubble cannot explain the sharp drop in land prices after 1980. He felt that the farmland market responds to available information, pricing farmland relative to its present value based on real interest rates and earnings from land in agricultural uses as measured by cash rents. Tweeten concluded land values fell after 1980 primarily because of direct and indirect impacts of high real interest rates. In his view, farmland values in the 1980's could be justified by prospective earnings.

Baffes and Chambers (1989) developed an empirical model to see if the farmland market crash of the 1980's was consistent with a bursting of a "rational bubble." A test to detect rational bubbles in agricultural land markets was applied to land price data for the 48 contiguous States. Although some differences existed among States, excessive volatility, which Baffes and Chambers attributed to rational bubbles, typified U.S. agricultural land price fluctuations during the 1950-86 period.

The empirical questions regarding the existence of speculative bubbles remain to be resolved. Carey (1990) concluded that "Statistical tests and other evidence are presented in support of an assertion that farmland prices rose well above fundamental values during the 1970's and then fell back in the 1980's" (p. 1). Kuchler and Tegene (1990) and Tegene and Kuchler (1990) tested the rational bubble hypothesis. The results provided little evidence to reject the hypothesis that market fundamentals determine farmland prices. In short, their tests showed no evidence to support the hypothesis that speculative bubbles contribute to farmland prices.

L.O. Scott (1990) examined 1912-84 prices of farmland for possible evidence of deviations from market fundamentals. Regression tests, volatility tests, and simple means tests were applied to a variety of real estate data series. The results on the national farmland data were somewhat supportive of the view that land prices reflect market fundamentals, but the recent price movements supported the opposite view.

Tegene and Kuchler (1991) in a subsequent paper found the present value model to be valid under an assumption of adaptive expectations but not under rational expectations. Rational expectations imply that policy influence will be felt quickly or will be recognized as transitory and therefore have little impact. Adaptive expectations suggest that policy changes will not be instantly realized in asset prices. They found that when asset values are influenced by

government intervention in markets, expectations raise issues of price adjustment speed and magnitude. Unlike macroeconomic models showing that rational expectations frustrate government policies, all anticipated transfers to the agricultural sector affect farmland prices. Government policies could be designed to alter farmland prices. In their view, the lack of rationality may occur because the farmland market displays significant transaction costs. Feedback from other asset markets does not force unrealized expectations to be instantly revised. They conclude, however, that volatility of the farmland market has not yet been measured relative to transaction costs.

Falk (1991) studied the plausibility of the constant expected returns version of the present value model as an explanation of farmland prices. Using Iowa farmland price and rent data over the 1921-86 sample period, formal test results indicate that, although farmland price and rent movements are highly correlated, price movements are not consistent with the implications of this model. There appear to be persistent predictable excess positive and/or negative returns in the Iowa farmland market. One possible explanation of the model's failure is that the farmland market is characterized by rational bubbles. However, the presence of such bubbles does not appear to characterize the situation and Falk argues for other explanations of the model's results (p. 9).

Tegene and Kuchler (1993), in their most recent work, use regression methods based on 1921-89 data to test how well the present value model under rational expectations explains farmland price movements. The empirical results suggest that farmers may be characterized as displaying satisficing rather than profit-maximizing behavior. If the objectives of farm real estate market participants are rational, so that every anticipated opportunity to profitably trade land is realized, then policy changes altering returns will lead to a rapid reevaluation of asset prices. The satisficing theory implies that policy changes may be irrelevant to farmland prices. Satisficing implies that the factors most likely to affect farmland demand, and thus farmland prices, are credit constraints, interest rates, and debt levels (p. 136). An interesting aside is their rejection of the present value land price determination model under rational expectations. In reaching this conclusion, they open the door for the presence of rational speculative land price bubbles (p. 142). They had largely ruled out this possibility in their earlier work on farmland price determinants.

In short, the research on farmland investment decisions based on market fundamentals and the possibility of speculative bubbles demonstrates little consensus. Kuchler and Tegene (1990) wrote that "it is impossible to prove conclusively that bubbles do or do not exist. Until economists can say exactly how fixed agricultural land is in agricultural production, no one will be certain how much income should be attributed to land" (p. 37).

Role of Credit in Inducing the 1970's Farmland Price Boom

There have been a number of questions raised about the role of credit and whether easy credit from farm mortgage lenders, particularly the life insurance companies, FCS, and FmHA, helped spur the 1970's farmland price boom. The factors influencing the supply of and demand for agricultural mortgage credit, farmland markets, and their interrelationship are complex. Hesser and Schuh (1963) hypothesized that the supply of credit offered to

agriculture is a function of lenders' expectations concerning the ability of farmers to repay, but admitted it was not known how lenders formulate expectations (p. 840). They further hypothesized that lenders considered "real" prices of farm products and the value of agriculture's assets in deciding how much credit to extend.

Credit is only one of numerous variables possibly influencing farmland prices. The policy or pragmatic view of credit's significance by those persons conducting the various studies obviously is influenced by how it is regarded philosophically. Such views range from credit's being a passive factor or a benign facilitator of economic change to its being an input carrying much associated risk and having an active or causal influence on land values. The optimistic view is illustrated by this Congressional testimony delivered by Irwin in 1983:

> I view credit as a facilitator of those changes that are being pressed on us by more basic economic, social, and political forces that directly affect the farm businesses of borrowers. In general, credit is not the cause of such changes, but the medium by which they are accomplished. Nor is it the job of a credit institution to impose its judgment on that of a borrower as he or she adapts to these forces, except when safety of the loan is involved. Thus, participation in general farm programs is ordinarily at the borrower's discretion. This leaves the entrepreneur the right to succeed or fail. It also means that sound overall credit may exist even when a borrower makes an unsound credit decision (p. 352).

The cautious view is epitomized by T.N. Carver's classic statement contained in the early editions of William Murray's *Agricultural Finance* textbook:

> There is no magic about credit. It is a powerful agency for good in the hands of those who know how to use it. So is a buzz saw. They are about equally dangerous in the hands of those who do not understand them. Speaking broadly, there are probably almost as many farmers in this country who are suffering from too much as from too little credit. Many a farmer would be better off today if he had never had a chance to borrow money at all, or go into debt for the things which he bought. However, that is no reason why those farmers who do know how to use credit should not have it (p. 1).

Several studies address land values and include credit (and debt levels) in some manner. Reinsel and Reinsel (1979) analyzed the economics of asset prices and current income in farming. They noted that a concentration of land ownership and wealth was occurring in agriculture. They also noted that it often has been argued that more lenient credit terms were required to ease the entry of young people into farming, but such terms only benefit the earliest buyers. They maintained that the cash flow and equity advantages are soon bid into the price of land. This means that with each relaxation of credit terms, land prices can be expected to rise more rapidly before resuming a normal pattern of change with future benefits discounted (p. 1096).

Shalit and Schmitz (1982) developed a model of farmland accumulation to study factors influencing U.S. farmland values. The model stressed the manner in which credit is allocated for land purchases. To secure the necessary loans for expanding farm size, the farmer provides his net accumulated wealth as collateral. In addition to income and consumption,

Shalit and Schmitz found the level of accumulated debt is one of the main determinants of farmland prices. The effects of owner equity on farmland price thus was examined. A derived demand for farmland was estimated as part of a structural equation model. They showed that as the banking system increased the supply of credit to farmers with land as collateral, land values rose at a faster rate than if no credit were available (p. 718). Thus, the expansion and contraction of credit importantly affects the pace at which land prices increase or decrease.

Brown and Brown (1984) examined the effect of current farm prices on farm buyers' expectations about the future distribution of purchasing bids. Results based on Corn Belt and Lake State data did not disprove the model's prediction that optimists' expectations dominated the farmland market. They did not find interest rates or credit availability to be highly important in explaining land values.

Hughes et al. (1984) employed a CAP model to examine subsidized credit offered by FmHA and its impact on agriculture. It was an attempt to quantitatively evaluate the impacts of subsidized credit on the farm real estate market. They concluded that government farm subsidies likely increased farm real estate values, farmers' holdings of financial assets, and farm debt. They felt the shortrun impacts of such government programs were small, but that over the long run, the government credit programs had probably increased farm sector wealth by hundreds of billions of dollars by increasing the price of farmland. In their view, it was highly unlikely that the rapid rise in farm real estate value during the 1970's should be attributed principally to government intervention on farm credit markets, but likely was caused by other factors such as the rapid increase in farm exports.

In contrast to Brown and Brown, Raup (1989) analyzed the most recent farmland boom and bust cycle and concluded that the driving force in the boom was a search for size economies by neighboring farmers. The "wisdom" of buying farmland was not restricted to farmers, but it infused their creditors as well. He noted that the conventional bid-price model used by creditors for valuing farmland encountered difficulty because of the rapid 1970's inflation and resultant negative interest rates. Real rates of interest on FLB farm mortgage loans were negative in 18 of the 32 quarters from 1973 through 1981 (Raup, p. 12).

Raup observed that booms in markets run on credit and, throughout the life of the 1970's farmland boom, credit was never a constraint (p. 8). Credit fueled the boom so that market-related debt was seen on a scale never before recorded in the United States (p. 9). In his view, this unique situation reflected an intense drive for market share by the lenders, especially the FLB's and to a smaller degree the Farmers Home Administration. He noted that the policies of the life insurance companies were less aggressive until the mid-1970's when they reversed policies and became more active (p. 11). But he did not find life insurance lending to be as strong a driving force as that of the FLB's.

Carey (1990) wrote that the heart of the 1970's farmland price boom and the 1980's farm credit crisis was the simultaneous existence of a land market deviation and a lender (FCS), organized as a cooperative, that was run by optimists about land prices. The FCS, he thought, has a built-in propensity to finance land price deviations. This propensity is especially pernicious because the land market is especially vulnerable to deviations. By using the

market price of an acre when determining its value as mortgage collateral, the FLB's took excessive risks.

So long as the land market is always approximately efficient, according to Carey, the FCS does not appear especially likely to cause credit crises. But if land price deviations sometimes occur, the FCS is then likely to be a destabilizing institution. He speculated that the 1970's land price deviation was the result of excessive optimism about future farm income and land prices on the part of at least some agents in a market where optimistic agents set prices. The FLB's clearly did not respond in a risk-averse fashion to the associated risk. He concluded that there is no evidence that the FCS deliberately financed or caused the credit crisis. Rather, the absence of all the usual risk control mechanisms from the FCS made it natural not to notice that it was setting up a credit crisis. He noted that lenders can prevent deviation-induced credit crises if they assess land at its fundamental value, but they probably cannot prevent the deviation itself. Lenders only amplify deviations and do not in general create them.

Carey's assessment was that evidence on the behavior of farm lenders other than the FCS did not support a firm conclusion. Commercial lenders did not withdraw completely from farm mortgage markets, but they did not make more new loans than the flow of old loan repayments. Thus, they also took excessive risks, although not to the same extent as the FLB's. He feels that the lender with the worst structure (FLB's) was most to blame. The failure of other lenders to increase their loans outstanding as rapidly as the FLB's may have been due to FLB's lower interest rates, and to the effects of disintermediation on fund availability at insurance companies and commercial banks. But he saw no evidence of a general recognition by commercial lenders that a deviation was in progress and that risk-avoidance strategies were required.

Ely and Vanderhoff (1990), in a study funded by a grant from the American Bankers Association, were aggressively critical of the FCS calling it a reckless lender to rural America that fueled a disastrous 1970's boom and 1980's bust in farmland prices. They blamed the Farm Credit Act of 1971 for liberalizing the collateral requirements and unleashing a farmland price boom. They regard the FCS during the 1970's as an imprudent lender. Debt-financed investments in farmland were made attractive and "This leveraging opportunity greatly stimulated the demand that inflated the enormous bubble in farmland values that finally burst in 1980" (p. 18). They concluded that the low real interest rates of the 1970's, fed by plentiful quantities of credit, "helped create a financial environment in which land values could skyrocket" (p. 19). Other lenders, in their view, including a specific reference to life insurance companies, were more cautious in their approach to the farm sector developments of the 1970's and earlier (pp. 1, 10).

Just and Miranowski (1993) developed a structural model of farmland prices based on 1963-86 data which included the multidimensional effects of inflation on capital erosion, savings-return erosion, and real debt reduction as well as the effect of changes in the opportunity cost of capital. Their results showed that inflation and changes in real returns on capital were major explanatory factors in farmland price swings. In addition, they explicitly studied the effects of credit market constraints and expectations schemes in the analytical model. Their model estimated only minor effects of credit availability on land prices (p. 167). Their

observations also suggested that the farm debt bubble may have occurred more as a consequence of high land values rather than as a causal factor (p. 157).

Ahrendsen and Khoju (1994) utilized an econometric model and a standard capitalization formula to examine the longrun relationships between farmland prices, cash rents, and credit. The study was for the 1921-94 period in Arkansas with the credit impact derived via the mortgage rate. It was found that changes in cash rent, determined mainly by farm profitability, have more effect on farmland price than changes in the mortgage rate, which is determined by the overall economy. The elasticities showed a 1-percent increase in cash rent increased farmland price by 2.82 percent, while a 1-percent increase in the farm mortgage rate decreased farmland price by only 0.21 percent. Policies aimed at increasing returns to farmland are likely to result in greater farmland price increases than policies directed at reducing mortgage rates.

Conclusions

The extensive farmland value literature contains an impressive list of factors that help determine farmland values. However, the list of price determinants from these studies is so long that it is evident why it is difficult to sort out the impacts of financial variables, such as credit, debt, interest rates, and related variables in determining farmland values. The remarkable feature about these studies is their lack of consensus. At the individual study level, the work seems to be quite encouraging. Agricultural economists have tended to develop farmland value models that, for a given study and data set, always seem to be able to "predict" or were deemed successful in the eyes of the authors. But even though many of the land value models appear to work on the data at hand, they fail once applied to a different data set or to the same data set for a different time period.

Speculative or rational bubbles are another factor that can influence farmland values which has been discovered and studied in recent years. A speculative bubble is essentially an overreaction to current price information. Several studies have been conducted to see if the 1970's farmland price boom resulted from a bubble. The empirical questions concerning the existence of speculative bubbles remain to be solved. Research on farmland investment decisions based on market fundamentals and the possibility of speculative bubbles demonstrates little consensus.

The research to date concerning the role of credit in the 1970's farmland price boom is also inconclusive. Credit is only one of numerous factors influencing farmland values and it is difficult to isolate a single variable. It appears that credit is more than a benign facilitator, but one finds it most difficult to make definitive conclusions concerning the 1970's. Critics of the actions of the farm mortgage lenders maintain that their extension of excess credit with generous terms fueled higher land prices than market fundamentals justified. Their defenders, however, say that they extended credit to willing borrowers under a rational economic scenario that included both current and capital gains from farmland. Lenders were just responding to a shift in credit demand.

Research demonstrates that the relationship between mortgage credit and farmland values is extremely complex. Even in the narrowest sense, the demand for mortgage credit to finance farmland as a productive asset is a derived demand conditional on the demand for farmland and all other inputs and the level of output supplied. Such credit is used as a means of obtaining control of land as an asset, but farmland has a number of other facets as a resource. Thus, it has been very difficult to isolate the effects of mortgage credit use on farmland values. One of the most important failings of many farmland value studies is the failure to recognize that farm income may not be adequate to explain agricultural land's market value.

Problems in conducting predictive farmland value research have arisen for a variety of reasons including a heavy emphasis on ex post facto analysis of secondary data using formal frameworks. Overly complex models, poor proxy variables, and the high volatility and imperfect understanding of the forces driving the farmland market make forecasting of farmland prices difficult (Gertel and Atkinson). Econometric models date from the 1960's but these have not performed well and are not widely used for forecasting (Gertel and Atkinson).

Attempts to replicate results of earlier land value studies have concluded that previously published models did not reflect accurately enough the relevant structural changes and other characteristics of the farmland market. Robison and Colyer (1994) concluded that the earlier studies did not produce cumulative knowledge or learning. Instead of building refutable models, they wrote, agricultural economists have constructed increasingly complex methodologies applied to fragile nonreplicable data sets that produce uninteresting results. Tomek's (1993) criterion for publishing a new model is that new results should increase our knowledge and not add to existing confusion (p. 14).

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