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Bruce L. Ahrendsen,
Atien Priyanti and Bruce L. Dixon

ARKANSAS AGRICULTURAL EXPERIMENT STATION

DIVISION OF AGRICULTURE — UNIVERSITY OF ARKANSAS

SEPTEMBER 1993 — BULLETIN 937

Editing and cover design by Elaine Williams

Arkansas Agricultural Experiment Station, University of Arkansas Division of Agriculture, Fayetteville. Milo J. Shult, Vice President for Agriculture and Director; L. B. Daniels, Interim Associate Vice President for Agriculture–Research. PS-1.2M-0993. The Arkansas Agricultural Experiment Station follows a nondiscriminatory policy in programs and employment. ISSN:0097-3491 CODEN:AKABA7

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Bruce L. Ahrendsen[†]
Assistant Professor
Department of Agricultural Economics
and Rural Sociology
University of Arkansas

Atien Priyanti[‡]
Former Graduate Student
Department of Agricultural Economics
and Rural Sociology
University of Arkansas

Bruce L. Dixon[†]
Professor
Department of Agricultural Economics
and Rural Sociology
University of Arkansas

[†]Principal of the Center for Farm and Rural Business Finance.
[‡] Currently with the Research Institute for Animal Production, Bogor, Indonesia.

Arkansas Agricultural Experiment Station
Fayetteville, Arkansas

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ACKNOWLEDGMENTS

The helpful comments of Dr. David L. Neff are gratefully acknowledged. This material is based upon work supported by the Cooperative State Research Service, U.S. Department of Agriculture, under Agreement No. 92-34275-8226. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U. S. Department of Agriculture or colleagues of the University of Arkansas.

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INTRODUCTION

During the decade of the 1980s, agricultural lenders experienced dramatic changes in their market share of both real estate and nonreal estate farm debt. Each of the four major institutional farm lender categories—commercial banks, Farm Credit System (FCS), Farmers Home Administration (FmHA) and life insurance companies—faced unique challenges, but these institutions are currently in stronger financial positions than during the mid-1980s when financial stress in the farm sector was at its highest. Although financial stress has diminished, most borrowers remain cautious about taking on new debt for expansion. Farm debt levels increased modestly in 1991 and were expected to increase slightly in 1992. However, debt levels after being adjusted for inflation have declined continuously since 1981. With moderate loan demand and improving loan portfolios, agricultural lenders are focusing competitive efforts on increasing their share of the farm debt market that has dwindled in the past decade.

Commercial banks are currently the largest institutional lenders to the farm sector and have dramatically increased their market share of total farm debt since 1981. As a result, the objective of this study is to identify factors influencing the dramatic changes in commercial banks' market share of agricultural loans in Arkansas. The extent to which changes in commercial bank lending to agriculture are associated with county economic, demographic and structural characteristics is investigated.

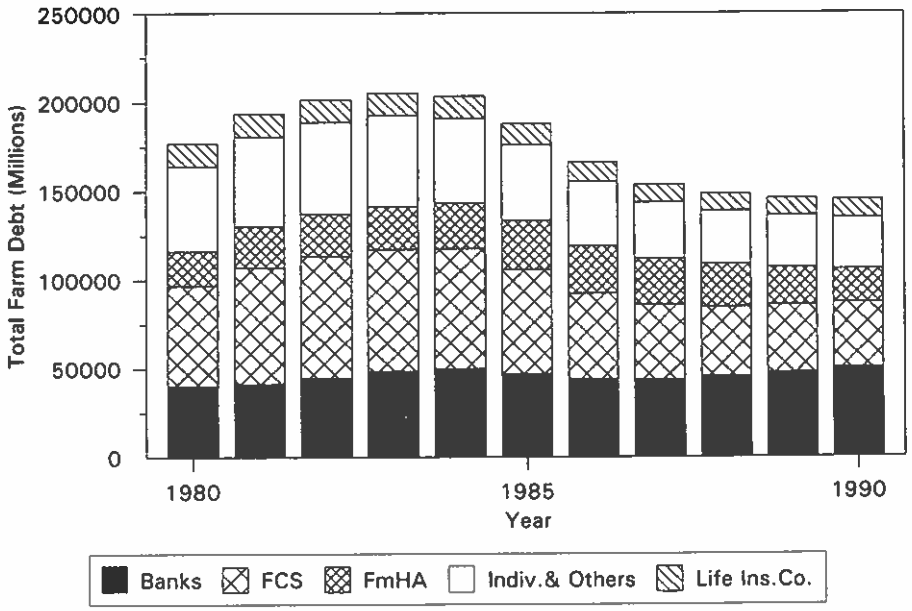
The study is organized as follows. In the first section, a brief review is given of the farm debt situation in Arkansas and the United States during the 1980s. The following section

discusses the methodology used. Changes in commercial bank market shares are decomposed into three principal components: portfolio decisions, loanable funds availability and loan market size. These market share components are computed for the 75 counties in Arkansas during the period 1986 through 1990. A regression model is hypothesized to identify the county characteristics related to changes in commercial bank market shares. In the empirical section this model is estimated. The empirical evidence from the estimated model indicates that county differences in aggregate economic activity, risk associated with agricultural and nonagricultural lending, regional location and farm structure contributed to the determination of fluctuations in commercial bank market shares.

THE SITUATION OF U.S. AND ARKANSAS AGRICULTURAL LENDERS

Total Farm Debt

Among the various types of agricultural lending institutions, commercial banks hold the largest share of total farm loans. The U.S. total farm debt at the end of 1990 (including operator households) is estimated at $145,059 million, a slight decrease of 0.6% from a year earlier and a 29.3% decline from the 1983 peak of $205,400 million (USDA, 1990) (Figure 1). However, total farm debt outstanding held by commercial banks increased by the end of 1990 by $2,712 million from a year earlier. The bulk of the decline in the U.S.



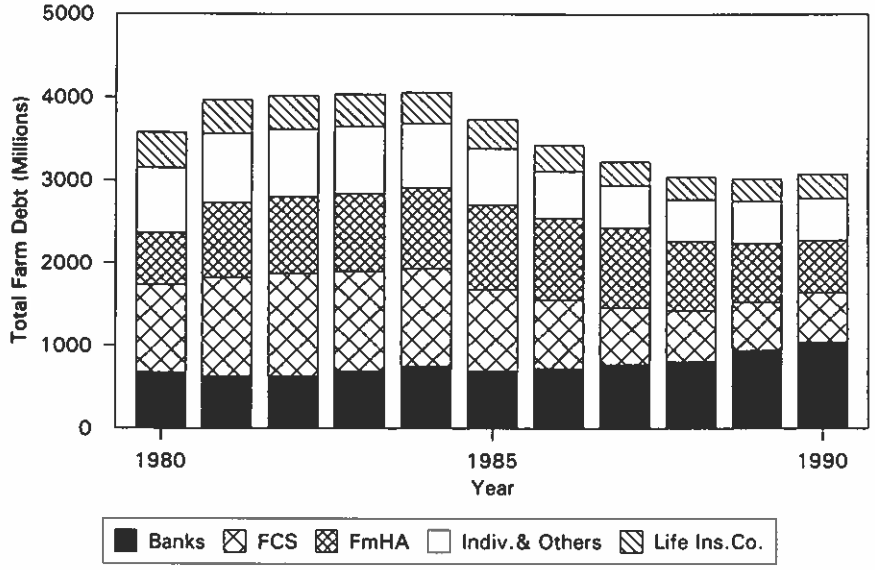
Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years

Figure 1. U. S. total farm debt outstanding: 1980 to 1990.

total farm loan volume outstanding from its peak in 1983 is attributable to FCS, FmHA, individuals and others. Life insurance companies remained stable. The FCS experienced the largest decline in loan volume. The decline in loan volume as of 1990 was $32,054 million, or a drop of 46.5% from its 1982 peak.

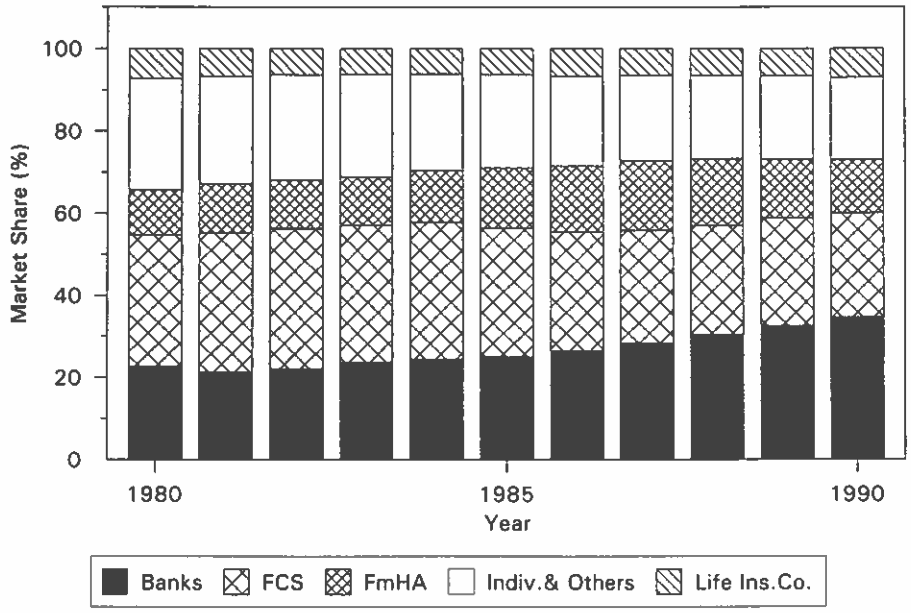
Agricultural lenders in Arkansas experienced a similar pattern of changes in total farm debt (including operator households) as was experienced by U.S. bankers overall during the 1980s. At the end of 1990, the Arkansas total farm debt was estimated at $3,079 million, an increase of 2.0% from a year earlier and a 24.2% decline from the 1984 peak of $4,062 million (USDA, 1991b) (Figure 2). The FCS also experienced the largest decrease in volume of $650 million, or a drop of 52% from its peak in 1982. A decline in volume was also experienced by FmHA, life insurance companies, individuals and others. However, while other agricultural lenders experienced declining total farm debt outstanding, commercial banks reached their peak of $1,045 million at the end of 1990, an increase of 11% from a year earlier.

During the decade of the 1980s, the U.S. commercial banks' market share of the total farm debt increased while the FCS market share decreased (Figure 3). The U.S. commercial banks' market share increased from a low of 21.2% in 1981 to a high of 34.6% in 1990. At the same time, the FCS lost market share from its peak of 34.2% in 1982 to 25.5% in 1990. The FmHA market share increased in the early 1980s, peaked in 1987 and decreased afterwards. Individuals and others decreased their market share continuously during the 1980s, and life insurance companies' market share remained stable.



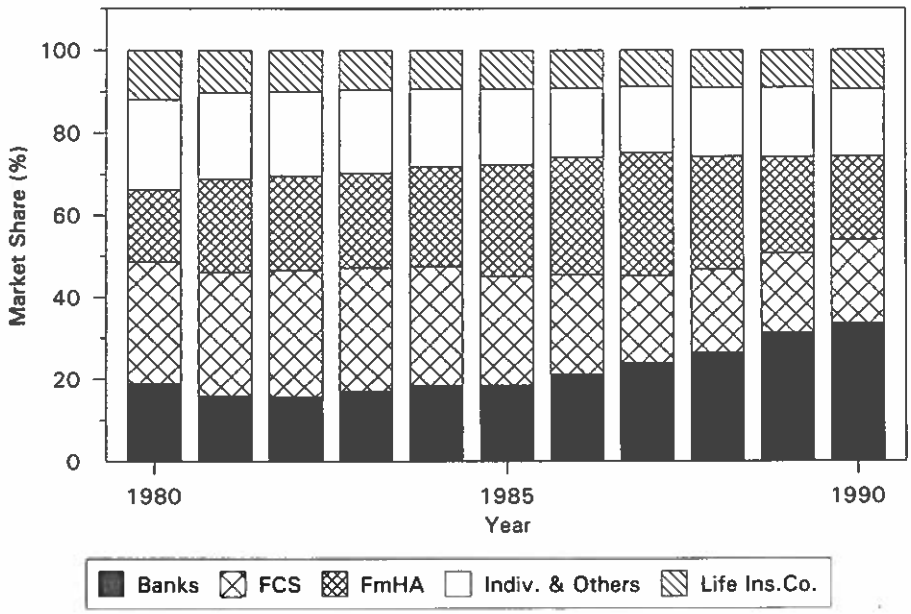
Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 2. Arkansas total farm debt outstanding: 1980 to 1990.



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 3. U.S. total farm debt market share: 1980 to 1990.



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 4. Arkansas total farm debt market share market share: 1980 to 1990.

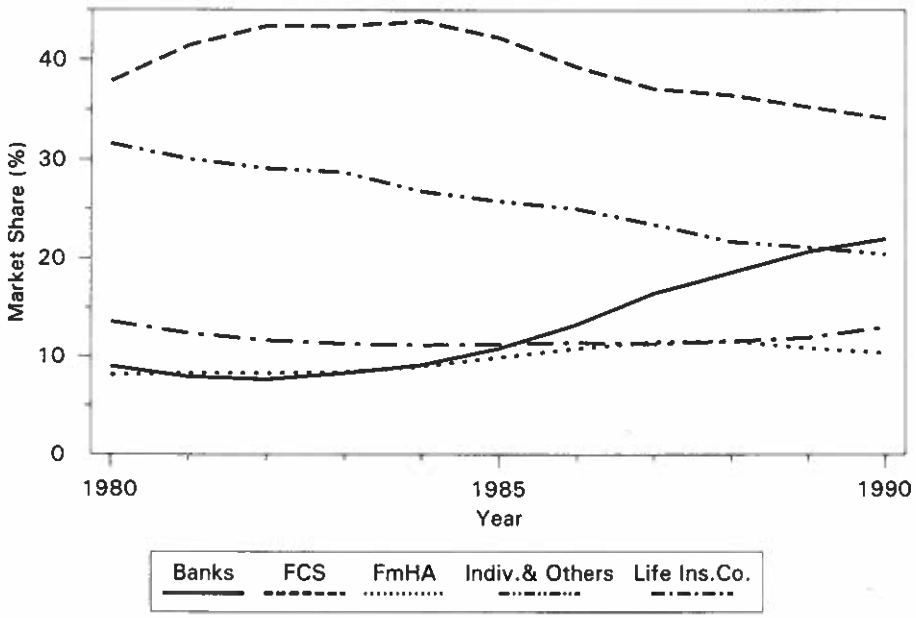
As in the total farm-debt market of the United States, Arkansas's commercial banks increased their market share, and the FCS market share declined for much of the 1980s (Figure 4). Arkansas commercial banks' market share increased from a low of 15.6% in 1982 to a peak of 33.9% in 1990. At the same time, the FCS market share decreased from a high of 31% in 1982 to 19.5% in 1990. The FmHA market share started to decrease after reaching a peak in 1987. The market share of individuals and others declined continuously during the 1980s, and the proportion of total farm debt held by life insurance companies remained stable.

Real Estate Farm Debt

Figures 5 and 6 present the U.S. and Arkansas real estate farm-debt market shares of agricultural lenders. Within the U.S. real estate farm-debt market, commercial banks increased their market share for much of the 1980s. Commercial banks went from a low of 7.6% in 1982 to a high of 21.9% in 1990. In 1990, commercial banks ranked behind the FCS, the largest farm real estate lender since 1977.

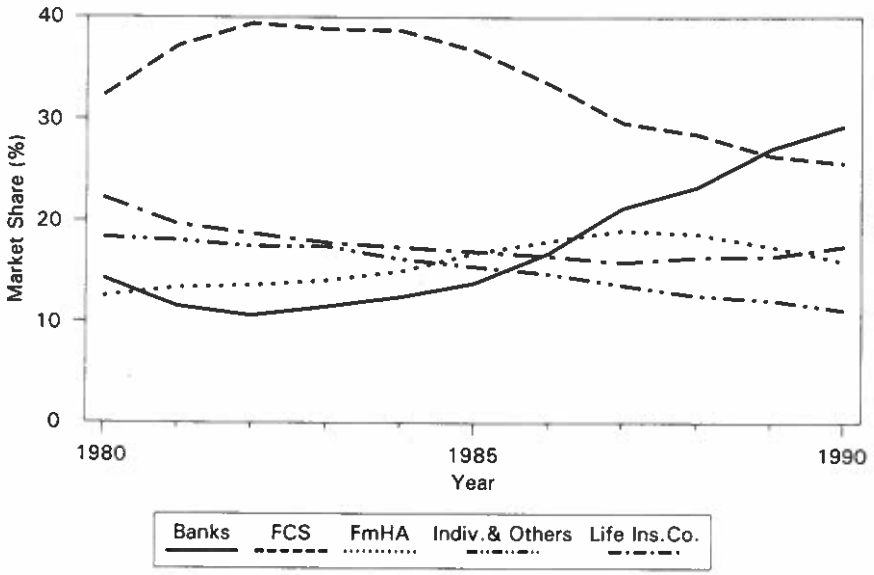
At the end of 1990, the FCS market share of U.S. real estate farm debt declined by 9.7% from its peak in 1984 of 44%. Loans held by the FCS in 1990 were 45% below their 1984 peak. Despite these changes, the FCS remains the dominant real estate lender in the United States.

The commercial banks' market share of Arkansas real estate farm debt increased in 1990 for the eighth consecutive year since 1982, making commercial banks the largest



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 5. U. S. Real estate farm debt market share: 1980 to 1990.



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 6. Arkansas real estate farm debt market share: 1980 to 1990.

agricultural real estate lenders. Commercial banks went from a low of 10.7% in 1982 to 29.4% in 1990, which is slightly more than the FCS market share of 25.8%.

Since reaching its peak in 1982, the FCS market share of Arkansas real estate farm debt has declined 13.6%. The FCS has gone from holding 39.4% of the market in 1982 to 25.8% in 1990. This represents a declining market share for eight consecutive years.

At the end of 1990, the FmHA market share of U.S. real estate farm debt experienced a decline of 1.2% from its peak in 1988 of 11.5%. Similarly, at the end of 1990, the FmHA market share of Arkansas real estate farm debt also decreased by 3% from its peak in 1987 of 19.1%. FmHA continued to shrink its supply of credit to farmers in 1990.

Agricultural real estate mortgages have been an important investment for life insurance companies and a key source of farm real estate loan funds for farmers. During 1990 the agricultural mortgage portfolios of life insurance companies continued to increase slightly in quantity as well as in market share. This is represented by an increase of $588 million (6.1%) and $23 million (8.5%) for the United States and Arkansas, respectively, from a year earlier (USDA, 1990).

Life insurance companies exhibited a slight increase in market share of U.S. and Arkansas real estate farm debt during 1990. This is represented by an increase of 1.1% and 1.0% for the United States and Arkansas, respectively, from a year earlier. During the 1980s, the market shares ranged from 11% to 13% for the United States and 16% to 22% for Arkansas.

Nonreal Estate Farm Debt

The commercial banks' market share of U.S. nonreal estate farm debt increased during the 1980s (Figure 7), making them the leading nonreal estate agricultural lender. Commercial banks' market share went from a low of 37.3% in 1981 to 49.4% in 1990. However, a number of important changes occurred in the nonreal estate farm debt market shares of Arkansas agricultural lenders, the most important being shifts between FmHA and commercial banks. In 1987, Arkansas commercial banks held only 26.9% of the market, while the FmHA held the largest market share at 43.2% (Figure 8). Since 1987, commercial banks have increased their market share substantially to 39.3%, and the FmHA decreased their market share to 25.9% in 1990.

Within the nonreal estate farm debt market at the end of 1990, the U.S. and Arkansas market shares held by FCS have decreased 10.0% and 14.8%, respectively, from their 1980 levels. In 1990, the FCS market share of the U.S. nonreal estate farm debt increased slightly by 0.1% from a year earlier; similarly, the FCS market share of the Arkansas nonreal estate farm debt increased slightly by 0.9%.

At the end of 1990, the FmHA market share of U.S. nonreal estate farm debt experienced a decline of 8.3% from its peak in 1987 of 24.3%. In Arkansas, the FmHA held the largest share of the nonreal estate farm debt among the agricultural lenders from 1981 through 1988. Although the FmHA's market share has declined since 1987, it was still the second largest lender of Arkansas nonreal estate farm debt in 1990.

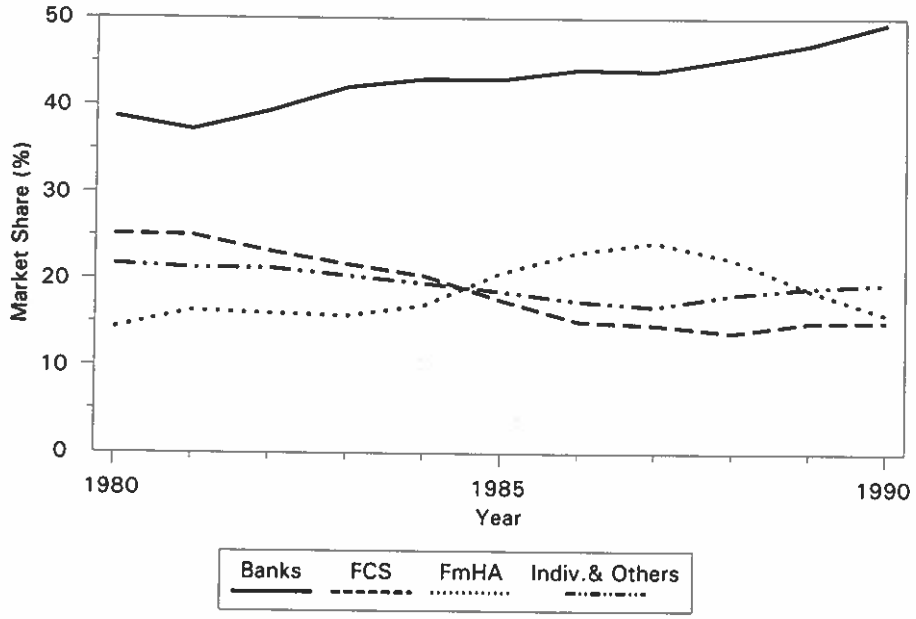
Section Summary

Nationally, total farm debt outstanding in 1990 represented a decline of 29.4% from its peak in 1983, while that of Arkansas represented a decline of 24.2% from its peak in 1984. Even though total national farm debt declined during the period 1983 through 1990, the market shares of individual lenders varied throughout the period. For example, commercial banks increased their market share since 1981. On the other hand, the FCS lost market share from 1982 through 1990, and the FmHA experienced an increasing market share from 1980 through 1987 and consecutive annual declines after 1987. Individual and other holders of the market share of the total farm debt declined during the 1980s, while that of life insurance companies remained stable.

The 1990 ranking among lender categories in Arkansas for real estate farm debt is commercial banks with 29.4%, FCS with 25.8%, life insurance companies with 17.5%, FmHA with 16.1% and individuals and others with 11.2%; and for nonreal estate farm debt the 1990 ranking is commercial banks with 39.3%, FmHA with 25.9%, individuals and others with 22.7% and FCS with 12.0% (USDA, 1991b).

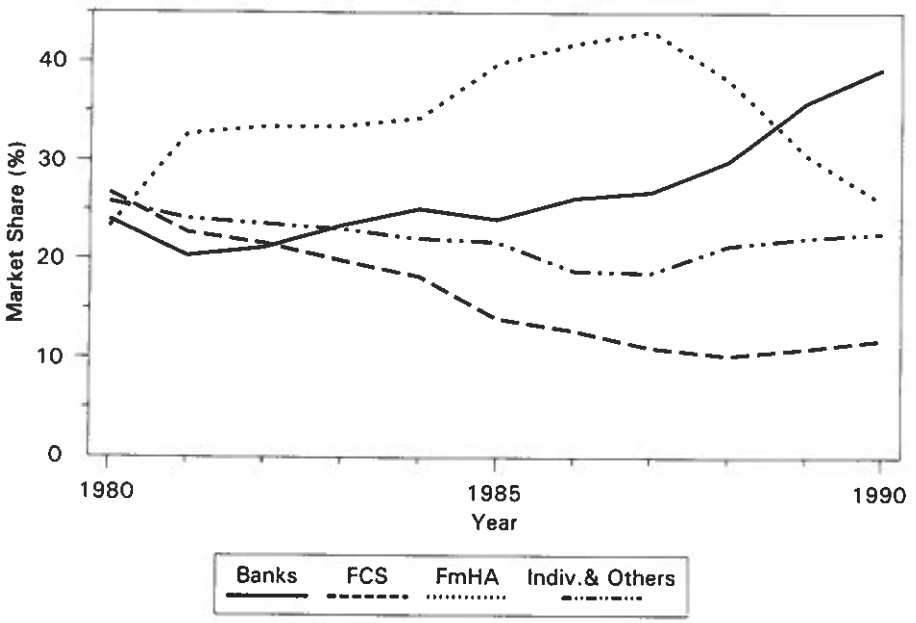
POSSIBLE REASONS FOR CHANGES IN MARKET SHARE AMONG AGRICULTURAL LENDERS

There are several possible reasons for the nationwide changes in market share among agricultural lenders over the past decade. These reasons include interest rate competitiveness, loan losses and a weakened financial condition for the FCS.



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 7. U. S. nonreal estate farm debt market share: 1980 to 1990.



Source: USDA, ERS, Economic Indicators of the Farm Sector. Various Years.

Figure 8. Arkansas nonreal estate farm debt market share: 1980 to 1990.

Interest Rate Competitiveness

Interest rates on farm loans declined slightly during 1990 among the major agricultural lenders with an overall decrease of 50 to 60 basis points[1]. Considerable differences in local agricultural credit market competition and the wide variety of available loan products, however, resulted in wide variation in interest rates for farm loans.

Average commercial bank real estate loan rates declined by only 37 basis points in 1990, from 12.08 to 11.71%, and commercial bank nonreal estate interest rates declined from an average of 12.5% in 1989 to an average of 11.5% in 1990, the largest decline of any agricultural lender. In comparison, FCS real estate loan rates declined from an average of 10.93% in 1989 to 10.56% in 1990, or 37 basis points, and FCS nonreal estate loan rates declined by 57 basis points. Life insurance companies' interest rates on agricultural real estate loans fell 28 basis points to 10.5% in 1990. FmHA regular real estate interest rates declined by 39 basis points, and that of nonreal estate interest rates declined by 29 basis points from 1989 to 1990. However, FmHA interest rates are not really comparable to interest rates for other lenders because FmHA interest rates respond only indirectly to financial market forces (USDA, 1991a). The data above show commercial banks experienced the largest decrease of the farm loan interest rates. This is indicative of commercial banks' volatile cost of loanable funds relative to other agricultural lenders. Hence, commercial banks continued to increase their market share of agricultural loans during a period of declining interest rates.

Loan Losses

A key concern of farm lenders is the amount of loan losses they must absorb. Estimated U.S. commercial bank farm loan losses totalled over $5 billion during 1984-90. Although these losses contributed to rural bank failures, total bank farm debt increased by almost $1 billion during this period. Commercial banks reported net recoveries (negative losses) in 1990 and are expected to report higher net recoveries in 1991 (Ryan et al., 1990). FCS losses were almost $4 billion during 1984-90. However, FCS loans outstanding dropped almost $28 billion, a decline of 43%. Together, these observations suggest that more FCS borrowers may have been lured away by other lenders (principally commercial banks) than were subjected to collection action by the FCS. As interest rates fell in the mid-1980s, bank loan rates became relatively more attractive because commercial banks based their interest rates on the marginal cost of funds; whereas, the FCS based their interest rates on the average cost of funds[2]. As a result of relatively more attractive interest rates at banks, many farmers shifted from the FCS to their local banks. In addition, as borrowers with low risk changed lenders, the reduction in the average quality of the FCS loan portfolio contributed to its financial difficulties.

The varying pattern of losses reflects institutional, accounting and regulatory differ-

[1] One basis point is 1/100 of 1%.

[2] The marginal cost of funds uses the cost of new funds acquired in financial markets to base loan pricing decisions. In contrast, the average cost of funds uses the average cost of existing funds to base loan pricing decisions.

ences. Commercial banks tend to focus on short-term farm production loans in which problems surface more quickly than for the long-term farm mortgages that dominate the FCS' loan portfolio. Thus, commercial banks could quickly adjust to a financial crisis. Moreover, until 1985 the FCS tended to extend more loan forbearance than commercial banks (USDA, 1991a).

FmHA had the highest delinquency rates in both dollars and share of the portfolio. FmHA has begun to account for losses that effectively occurred in the early 1980s. By the end of 1991, FmHA losses (of principal and interest) may approach $11 billion, with write-offs totalling almost $8 billion during 1989-91 (Ryan et al., 1990).

Weakened Financial Condition of the FCS

Because of the financial distress over the past decade, the FCS has undergone structural changes, primarily as directed by the Agricultural Credit Act of 1987. Among the changes was a restructuring and merging of FCS banks and associations, establishment of agencies such as the Farm Credit Assistance Board, the FCS Financial Assistance Corporation, and the FCS Insurance Corporation, and the reorganization of the Farm Credit Administration as an arm's length regulator. In addition, in 1987 the FCS received access to financial assistance guaranteed by the Secretary of the Treasury and backed by the U.S. Government, which allowed the FCS to restructure its liabilities and switch from average to marginal cost pricing of loans[3]. These structural changes were designed to facilitate the movement of capital among FCS institutions and to eliminate some inefficiencies that had evolved within the FCS (USDA, 1991a).

In general, 1990 FCS performance was stable relative to 1989, and core earnings for the FCS continued to improve. For the second year in a row, more net income was derived from interest income and less from the reversal of loan reserves (USDA, 1991a). The FCS is offering farm customers lower interest rates and favorable credit arrangements in an effort to regain market share.

Section Summary

The overall paydown in the farm loan portfolio appears to have been driven more by demand than supply. For a variety of reasons, farmers have decided to hold less debt. Large amounts of debt, coupled with relatively high interest rates, low farm income and declining asset values, made debt servicing costly in the early 1980s. However, farmers continued to decrease their debt levels from 1987 through 1990. Although interest rates were lower, farm income increased and asset values stabilized.

In general, financial institutions serving agriculture in Arkansas continued to recover in 1990. Total farm debt in 1990 (including household debt) was estimated at $3,079 million, an increase of 3% from a year earlier but a 24% decline from the 1984 peak of $4,062 million. The bulk of the 1990 increase in volume was attributable to commercial banks, FCS and life insurance companies. Increases in farm loans held by these financial institutions were partially offset by a decrease in loans held by the FmHA.

[3] Two assisted Farm Credit Banks, Agribank and Omaha, have prepaid the assistance debt.

Interest rate competitiveness among lenders, loan losses by lenders and a weakened financial condition for the FCS are possible factors explaining market share changes among agricultural lenders. However, interest rate competitiveness, loan losses and financial strength are difficult to quantify for this study since county-level data on these factors are unavailable. Thus, the preceding section has been descriptive. In the next section the methodology and data used in this study to analytically identify factors influencing the changes in commercial banks' market share of agricultural loans in Arkansas are presented.

METHODOLOGY AND DATA

Wilson and Barkley (1988) developed a model to explain changes in market share over time. In this paper their methodology is used to analyze the market share of Arkansas commercial banks for both nonreal estate and real estate agricultural loans. First, the percentage change in commercial bank market share is decomposed into percentage changes in portfolio decisions, loanable funds availability and loan market size. Next, the changes in the components of market share are explained by exogenous factors in a seemingly unrelated regression framework.

Model Structure

Commercial banks' market share of agricultural loans can be expressed as:

$$\begin{aligned} MS &= BAL/TAL \\ &= [(BAL/BD)*BD]/TAL, \end{aligned} \tag{1}$$

where

MS = commercial banks' market share of agricultural loans,
BAL = total bank agricultural loans (thousands of dollars),
TAL = total agricultural loans outstanding (thousands of dollars), and
BD = total bank deposits (thousands of dollars).

Totally differentiating equation (1) yields:

$$\begin{aligned} dMS = {} & [d(ALDR)*BD/TAL] + [ALDR*d(BD)/TAL] \\ & - [ALDR*BD*d(TAL)/TAL^2], \end{aligned} \tag{2}$$

where

ALDR = the agricultural loan-to-deposit ratio for the commercial bank.

By dividing (2) by (1), rearranging terms and multiplying by 100, a percentage change in commercial banks' market share can be expressed as:

$$100*dMS/MS = 100*[d(ALDR)/ALDR + d(BD)/BD - d(TAL)/TAL]$$
$$PCMS = PCALDR + PCBD - PCTAL \quad (3)$$

where

100*d(ALDR)/ALDR = PCALDR = the percentage change in the agricultural loan-to-deposit ratio (portfolio decisions),

100*d(BD)/BD = PCBD = the percentage change in bank deposits (loanable funds availability),

100*d(TAL)/TAL = PCTAL = the percentage change in total agricultural loans outstanding (loan market size).

The percentage change in agricultural loan-to-deposit ratio (PCALDR) measures the change in the portfolio decision of a commercial bank. Commercial banks have a responsibility to service all sectors of the economy, and a decision must also be made as to what proportion of the loan funds will be allocated to agricultural borrowers, consumers, businesses or commerce. In particular, commercial banks must allocate deposits among loans and alternative investments such as government securities, municipal bonds, agency bonds and reserves.

The percentage change in bank deposits (PCBD) measures the change in the availability of funds. Commercial banks have relied extensively on deposits as the principal source of funds to finance their assets. Therefore, the growth of a commercial bank depends primarily upon the growth of its deposits. The volume of funds that management will use for creating income is determined by the commercial bank's policy toward aggressiveness in acquiring deposits.

Commercial banks are distinct from all other lenders in their ability as a group to create money in the form of bank deposits by making loans and investments. However, in some periods growth in deposit volume has not kept pace with the growth in aggregate demand for loans. This difference can be particularly troublesome for a rural bank with limited access to sources of funds outside the local deposit market. For many rural banks, loan demand increases dramatically prior to the planting period when supplies such as seed, fertilizer and chemicals are purchased. Thus, a rural bank may not have sufficient funds to meet its goals in agricultural lending at a specific time.

The percentage change in total agricultural loans outstanding (PCTAL) indicates the change in loan market size. For many rural banks, farm loans account for a sizable portion of total loans. However, for the U.S. financial market, farm loans accounted for only 3% of the nation's total loans in 1990. Hence, farmers have to compete with consumers, nonfarm businesses, governments and others for a limited supply of funds.

Equation (3) is an identity, but it is exact only for infinitesimal changes in ALDR, BD and TAL. For the discrete time analyzed in the present study, equation (3) holds only as an approximation because the changes in ALDR, BD and TAL are substantially larger than infinitesimal. Equation (3) implies PCALDR and PCBD have a positive relationship with the percentage change in commercial banks' market share of agricultural loans, while the PCTAL is inversely related with the percentage change in commercial banks' market share of agricultural loans. The accuracy of (3) in describing changes in commercial bank

market share and the importance of PCALDR, PCBD and PCTAL are examined in the empirical section of this study.

System of Equations

Equation (3) is an identity because it is derived from (1), which is a definition. The Wilson and Barkley (1988) approach explains variation in market share by explaining the variation in PCALDR, PCBD and PCTAL. In this section, each of the three components of change is modelled as a dependent variable to give a system of three equations. The system is hypothesized to be:

$$PCALDR_i = a_0 + a_1 PCNFI_i + a_2 PCFI_i + a_3 RISK_i + a_4 POP_i + a_5 BANK_i + a_6 MSA_i + e_i \quad (4)$$

$$PCBD_i = b_0 + b_1 PCNFI_i + b_2 PCFI_i + b_3 POP_i + b_4 BANK_i + b_5 PCUN_i + b_6 MSA_i + u_i \quad (5)$$

$$PCTAL_i = c_0 + c_1 PCFI_i + c_2 POP_i + c_3 PCSIZE_i + c_4 PCVAL_i + c_5 MSA_i + v_i \quad (6)$$

where

$PCALDR_i$, $PCBD_i$ and $PCTAL_i$ are the observations on the percentage changes for the i^{th} county.

The independent variables in (4), (5) and (6) are defined in Table 1. The i^{th} observation on a variable gives the value of that variable for the i^{th} county. These variables represent demographic and economic activity, number of commercial banks, the relative risk associated with agricultural lending and farm structure.

Table 1. Definitions of variables used in model estimation.

Variable	Definition
PCNFI	The percentage change in nonfarm income (%)
PCFI	The percentage change in farm income (%)
RISK	The ratio of the coefficient of variation in nonfarm income to the coefficient of variation in farm income
POP	The ratio of the percentage change in the number of farms to the percentage change in population
PCUN	The percentage change in unemployment rates (%)
BANK	The number of banks in the county in 1990
PCSIZE	The percentage change in average farm size (%)
PCVAL	The percentage change in the value of land and buildings (%)
MSA	The dummy variable for metropolitan statistical area (urban area) (1=urban, 0=otherwise)
e, u and v	The error terms

The variables selected to explain changes in demand for agricultural loans are percentage change in farm income (PCFI) and ratio of percentage change in number of farms to percentage change in total population (POP). The demand for nonagricultural

loans is captured by percentage change in nonfarm income (PCNFI) and percentage change in unemployment rate (PCUN). These variables are demand shifters.

It is hypothesized that PCNFI is negatively related to the portfolio decision and positively related to a banks' availability of deposits for loanable funds. The PCFI is expected to be positively related to the portfolio decision, a banks' deposits and loan market size. POP as a local market demand variable is also expected to be positively related to the three dependent variables: portfolio decision, bank deposits and loan market size. In addition, PCUN as an indicator of the growth of the economic vitality in the community is hypothesized to be negatively related to bank deposits.

In equation (4), RISK is used to measure the risk associated with nonfarm loans relative to farm loans. RISK is the ratio of the coefficient of variation of non-farm income to the coefficient of variation of farm income. The farm business has production uncertainty that may be caused by variations in weather, disease, insects and other biological factors. When yields are below normal, income may be inadequate to cover costs, and as a result, cash deficits accumulate. Besides production uncertainty, farmers also face price uncertainty. In recent years, farm commodity prices have fluctuated dramatically, and price uncertainty always has been a major consideration in farming.

Commercial banks are concerned with the risk involved in making farm loans. Commercial banks can lend to all types of farmers, but some farmers are better risks than others. A banker must evaluate the applicant's request and either approve the loan as requested, approve the loan with certain adjustments or reject it. The ability of the banker to handle this task determines to a large extent how successful the institution is in serving a farm community and stockholders. Hence, RISK is expected to be positively related to the portfolio decision since increases in farm income risk, *ceteris paribus*, make RISK decline.

The degree of banking competition within a county is measured by the number of banks in the county (BANK). The competition faced by an individual bank may come from other commercial banks operating in the same county. Competition is likely to influence the volume of a bank's agricultural loans. In this study, a bank's market area is delineated by county boundaries under the assumption that the local market characteristics and flow of funds are for the county in which the bank is located.

Barkley et al. (1984) measured the degree of competition by the number of alternative credit sources in a community, such as other banks, savings and loan associations, industrial banks and credit unions. A study by Betubiza and Leatham (1992) measured a bank's competition based on the asset volume of its competitors in its market. They computed a competition index that consisted of Production Credit Association assets as the major competitor of commercial banks in the nonreal estate farm loan market plus total assets of the commercial banks operating in the same county. The study presented here takes the simpler approach of measuring competition as banks per county by assuming farmers have uniform access across Arkansas to other agricultural lenders such as the FCS and FmHA.

Changes in the size and structure of agricultural firms are reflected by the percentage change in average farm size (PCSIZE) and the percentage change in the value of land and buildings (PCVAL). These two variables are related to the changes in real estate and fixed asset purchases, which should be positively related to the changes in total agricultural loans.

Another measure of the demand for variety of bank loans is the degree of rurality of a county. A rural county is likely to have a large proportion of agricultural loans to total loans. Federal statistical agencies define metropolitan or urban counties as all counties including a total population of at least 50,000 or an urbanized area of at least 50,000 with a total population of at least 100,000. Using these criteria, the U.S. Office of Management and Budget designates 10 Arkansas counties as metropolitan areas. These counties are Washington, Crawford and Sebastian in northwestern Arkansas; Faulkner, Saline, Pulaski, Lonoke and Jefferson in central Arkansas; Crittenden in eastern Arkansas; and Miller in southwestern Arkansas. In this study, MSA is a binary variable taking on a value of 1 if an observation comes from one of these 10 urban counties and 0 if otherwise. The counties of Arkansas that are considered rural and urban areas are shown on Appendix Figure 1 (page 29).

Zellner's seemingly unrelated regression (SUR) technique (Zellner, 1962) is employed to estimate the coefficients in (4), (5) and (6). SUR is used in a situation in which there is more than one equation to estimate and the disturbance terms (e_i, u_i and v_i) in these different equations at a given point in time are likely to reflect some common unmeasurable or omitted factors and, therefore, are correlated (contemporaneous correlation) (Judge et al., 1988). In this circumstance SUR gives more efficient estimates than ordinary least squares. The SHAZAM (White et al., 1990) software package is used for all estimations.

Data and Sources

The data used in this study are drawn from several sources: U.S. Department of Commerce, Bureau of Economic Analysis (BEA); the Federal Deposit Insurance Corporation Call Reports of Income and Condition (call reports); the Farm Credit Bank of St. Louis, which has since merged with the Farm Credit Bank of St. Paul to form AgriBank in St. Paul; the FmHA State Office in Little Rock; Arkansas State and County Economic Data (1991) of the University of Arkansas at Little Rock; and the Arkansas Agricultural Statistical Service (1982 and 1987). The data base of BEA offers detailed information on annual county characteristics such as total farm and total nonfarm personal income, total employment, total labor force and total population from 1976 through 1990.

The call reports contain detailed, bank information such as total agricultural production loans, total agricultural real estate loans, total non-interest bearing deposits, total interest bearing deposits and number of banks in a county. Call reports are available on a quarterly basis from 1976 through 1990.

The Farm Credit Bank of St. Louis and the FmHA State Office in Little Rock provide information on total agricultural loan volume for the state of Arkansas by county. The data cover the period 1986 through 1990.

The Arkansas State and County Economic Data from the University of Arkansas at Little Rock give the information on the annual unemployment rate from 1986 through 1990 by county. This unemployment rate is based on the percent of the civilian labor force.

The Arkansas Agricultural Statistical Service provides information on the number of farms, the farm size and the value of land and buildings in Arkansas for the years 1982 and 1987 by county.

The data used in this study are treated as cross-sectional data, i.e., one observation per county. The percentage change variables compute the percentage of change from 1986 to 1990. Because Arkansas has 75 counties, there are 75 observations (N=75) for the model. All dollar values and percentage changes are based on real dollar figures (1982 = 100). The bank financial information is based on the fourth quarter call reports as of 31 December 1986 and 31 December 1990 for 256 commercial banks aggregated to the county level.

Descriptive Analysis

Table 2 presents the observations on PCALDR, PCBD and PCTAL for the 75 counties in Arkansas. The portfolio, loanable funds and loan market size components of changes in market shares vary greatly among counties. The variation in the sign and magnitude of the portfolio decision is large. For example, Drew County had a percentage change in commercial bank agricultural loan-to-deposit ratio (PCALDR) of 258.9%, and Dallas county experienced a PCALDR of -89.2%.

The second component of the percentage change in commercial bank market share,

Table 2.Percentage change in market share components by Arkansas counties, 1986-1990.

	Dependent Variables		
County	Portfolio Decisions (PCALDR)	Loanable Fund (PCBD)	Loan Market Size (PCTAL)
Arkansas	19.4	-1.8	-1.2
Ashley	-18.6	-4.4	-39.6
Baxter	-10.9	8.6	-24.6
Benton	19.4	12.6	-6.1
Boone	139.5	-10.3	-5.7
Bradley	15.5	-2.6	-16.6
Calhoun	-85.9	3.1	-36.0
Carroll	7.0	5.7	-17.0
Chicot	28.5	-4.5	-20.3
Clark	82.7	4.5	-15.8
Clay	76.0	5.4	-30.6
Cleburne	11.9	4.8	-20.9
Cleveland	N/A	-1.3	-34.3
Columbia	-65.8	2.5	-47.4
Conway	-22.8	-1.2	-21.5
Craighead	36.4	-0.4	-10.8
Crawford	-35.1	25.0	-23.7
Crittenden	36.9	-3.2	-32.7
Cross	88.9	17.9	-1.8
Dallas	-89.2	-4.6	-44.5
Desha	88.5	-2.8	-15.9
Drew	258.9	1.0	-28.6
Faulkner	-30.9	-2.4	-19.3
Franklin	5.9	20.4	4.8
Fulton	-6.4	-3.3	-25.2
Garland	72.1	-58.4	-14.9
Grant	-64.2	-1.0	-45.9
Greene	10.1	3.9	-19.0

Table 2. Continued.

County	Dependent Variables		
	Portfolio Decisions (PCALDR)	Loanable Fund (PCBD)	Loan Market Size (PCTAL)
Hempstead	27.2	5.2	-17.3
Hot Spring	143.4	14.2	-7.5
Howard	30.4	-1.4	-21.4
Independence	142.9	4.5	-15.4
Izard	5.7	17.5	-25.7
Jackson	17.6	16.0	-26.4
Jefferson	16.9	-9.4	-9.7
Johnson	26.1	7.4	-12.0
Lafayette	6.1	-3.0	-13.0
Lawrence	7.8	4.2	-25.1
Lee	104.3	-40.3	-26.0
Lincoln	2.6	4.4	-30.8
Little River	2.8	18.1	-15.8
Logan	-12.6	-0.1	-20.6
Lonoke	29.8	5.0	-24.6
Madison	-19.2	6.3	-26.3
Marion	-35.2	-9.4	-26.6
Miller	29.0	-5.4	-15.2
Mississippi	22.7	12.5	-18.7
Monroe	3.8	-1.0	-26.3
Montgomery	47.6	-6.9	-6.4
Nevada	9.0	2.1	-25.4
Newton	82.2	1.1	-1.3
Ouachita	127.3	-12.5	-39.0
Perry	74.0	4.8	-7.5
Phillips	8.5	-0.1	-9.7
Pike	63.0	14.5	-0.6
Poinsett	17.3	4.4	-13.9
Polk	-27.6	11.0	-24.3
Pope	-10.3	5.4	-15.3
Prairie	1.5	8.3	-23.2
Pulaski	-28.7	-3.2	-26.9
Randolph	2.7	10.7	-20.8
St. Francis	-2.5	0.03	-31.0
Saline	-46.9	0.8	-14.3
Scott	-0.7	6.0	-6.9
Searcy	-4.2	-1.3	-22.0
Sebastian	-34.7	-2.3	-41.9
Sevier	55.9	7.6	1.6
Sharp	33.8	16.3	13.6
Stone	61.7	-0.5	0.4
Union	195.0	-26.0	0.2
Van Buren	9.8	9.5	-29.9
Washington	-7.4	8.0	-46.3
White	-3.9	13.5	-4.8
Woodruff	27.1	-6.0	-24.0
Yell	47.5	-0.4	-35.7

N/A = The variable is undefined.

percentage change in loanable funds (PCBD), also displays a wide variation among Arkansas counties. Crawford County experienced the largest relative increase in bank deposits during the study period. On the other hand, Lee County experienced a dramatic decrease in bank deposits during the same time.

The third component, percentage change in loan market size (PCTAL), varies mildly across counties. All counties experienced decreasing loan market size except for Franklin, Sevier, Sharp, Stone and Union counties. In general, market size expansions in Arkansas agricultural lending were limited.

In a preliminary estimation of (4), (5) and (6), 11 counties were identified as statistical outliers. The 11 counties were Boone, Calhoun, Cleveland, Columbia, Dallas, Grant, Hot Spring, Independence, Marion, Ouachita and Sharp. They were omitted from the sample used to estimate (4), (5) and (6). The reasons for omitting these counties in terms of county characteristics are discussed next.

Cleveland County had infinite growth in agricultural loans from 1986 to 1990 because this county reported no agricultural loans in 1986. Since the PCALDR is undefined for Cleveland County, it is excluded from the sample.

Marion County had large total nonfarm income variability relative to total farm income variability. This yielded a large value (31.7) for the RISK variable. It is unreasonable to expect that the coefficient of variation in nonfarm income is 31 times larger than the coefficient of variation in farm income. Therefore, this study also excludes Marion County from the data sample.

The other nine outlier counties were detected by identifying county data points in which magnitude of calculated residuals from the estimation of (4) exceeded two times its standard error. This is a common method for identifying statistical outliers (Belsley et al., 1980). PCALDR was the most strongly correlated variable with PCMS compared to PCBD and PCTAL. Thus, the outliers were identified using equation (4).

The nine outlier counties were found to have either substantial decreases or substantial increases in commercial bank agricultural loan volumes during the study. The counties experiencing substantial decreases in commercial bank agricultural loan volumes from 1986 to 1990 were Calhoun (85%), Columbia (65%), Dallas (90%) and Grant (65%). The counties experiencing substantial increases in commercial bank agricultural loan volumes from 1986 to 1990 were Boone (115%), Hot Spring (178%), Independence (154%), Ouachita (99%) and Sharp (118%). These large increases (decreases) in commercial bank agricultural loans yielded large positive (negative) values for the percentage change in the agricultural loan-to-deposit ratio.

Table 3 presents a descriptive summary of the variables used to estimate the model for the 64 observations in the sample. A descriptive summary of the variables for the 75 counties is presented in Appendix Table 1 (page 29). The results show that except for variables PCTAL, PCVAL and PCUN, all of the variables have positive means, which indicates that, on average, those variables tended to increase from 1986 through 1990.

PCALDR has a mean of 22.02% but ranges between -46.88 and 258.92% (Table 3). PCALDR has a large variation as indicated by a standard deviation of 45.36%. The positive mean of the PCALDR indicates that the county average proportion of agricultural loans in

Table 3. Descriptive analysis of the variables used (number of counties = 64).

Variables	Mean	Standard Deviation	Minimum	Maximum
PCALDR (%)	22.02	45.36	-46.88	258.92
PCBD (%)	2.57	12.06	-58.38	25.01
PCTAL (%)	-18.32	11.51	-46.27	13.64
PCNFI (%)	5.12	5.33	-6.49	16.63
PCFI (%)	64.94	109.88	-42.92	461.13
POP	0.56	5.55	-24.20	17.90
PCUN (%)	-22.47	17.86	-57.48	31.82
RISK	0.70	1.41	0.005	6.41
BANK	3.51	2.30	1.00	14.00
PCVAL (%)	-28.20	15.58	-52.53	21.34
PCSIZE (%)	3.03	9.07	-21.43	32.40

NOTE: Variable name definitions are presented in Table 1.

commercial bank investment portfolios increased during the period 1986 through 1990.

PCBD has a mean of 2.57%, a minimum of -58.38% and a maximum of 25.01%. The variability of PCBD also is large as indicated by a standard deviation of 12.06%. The positive mean indicates increased bank deposits, and hence, economic growth.

PCTAL has a negative mean of -18.32%, a minimum of -46.27% and a maximum of 13.64%. The negative mean implies that the total county-level agricultural loans decreased from 1986 through 1990. This is consistent with the information provided in Figure 2 showing that total agricultural loans by agricultural lenders in Arkansas decreased by 24.2% from their peak in 1984.

The means of the demand independent variables (PCNFI, PCFI, POP and PCUN) are 5.12%, 64.94%, 0.56 and -22.47%. The variability in nonfarm income, is less than the variability in farm income, which is reflected by standard deviations of 5.33% and 109.88%, respectively. PCNFI ranged from a minimum of -6.49% to a maximum of 16.63%, and PCFI ranged from a minimum of -42.92% to a maximum of 461.13%.

RISK as a measure of the relative variability of nonfarm income to farm income has a mean of 0.7 with a minimum of 0.005 and a maximum of 6.41. The variability of RISK as indicated by the standard deviation is 1.41. A mean less than one indicates that, on average, nonfarm businesses have less income risk than farm businesses.

Summarizing the growth patterns, county economic activity in Arkansas increased from 1986 to 1990. In addition, farm income was more variable than nonfarm income. Since farm income in Arkansas is concentrated in rural counties, income variation is disproportionately concentrated in rural counties.

The number of commercial banks in each county across Arkansas (BANK) varied from a minimum of one bank to a maximum of 14 banks. The mean of BANK is 3.51 with a standard deviation of 2.30. There are eight counties in Arkansas that had only one bank in 1990. Not surprisingly, all of these counties are rural. Similarly, urban areas tend to have more banks. For example, Pulaski County had 14 banks and Washington County had 9 banks in 1990.

Other variables used as explanatory variables in the PCTAL equation are PCVAL and

PCSIZE. The means of these variables are -28.20% and 3.03%, respectively. PCVAL ranged from -52.53% to 21.34%, and PCSIZE ranged from -21.43% to 32.40%. PCVAL's negative mean indicates the average county value of land and buildings across Arkansas decreased. On the other hand, PCSIZE indicates that county average farm size increased.

RESULTS

Ordinary Least Squares Regression Results

Equation (3) is an identity in the mathematical sense, so it is true by definition. However, it is only completely accurate for infinitesimal changes in the three components. For larger changes, such as those observed in real world banking situations over several years, equation (3) is only an approximation. The goal of this study is to find those factors that cause changes in PCALDR, PCBD and PCTAL as a means of understanding changes in a commercial bank's market share. However, before explaining the variation in PCALDR, PCBD and PCTAL, it is necessary to verify that (3) is approximated well for the data used in the study.

The results of regressing PCMS on PCALDR, PCBD and PCTAL are presented in Table 4. All three of the independent variables are highly significant and of the expected sign. Ninety-eight percent of the variation in the dependent variable is explained. However, ideally R^2 would be one, the coefficients of PCALDR and PCBD would be one and the coefficient of PCTAL would be minus one. Also, the intercept would be zero. All of the four parameter estimates are significantly different from their hypothesized values. This divergence is due to the fact that (3) is only exact for infinitesimal changes in the three components and data accuracy. This latter aspect acknowledges that the accuracy of the data in computing PCMS and the three components is less than perfect. Nonetheless, the high R^2 and levels of significance of the model in Table 4 indicate that the three components of PCMS are important determinants of the level of PCMS. Thus, it is important to identify and quantify the variables that explain variation in these three components.

Table 4. Regression results of PCMS on PCALDR, PCBD and PCTAL.

Variable Name	Estimated Coefficient	Standard Error
Constant	- 17.561***	2.327
PCALDR	1.331***	0.025
PCBD	1.876***	0.110
PCTAL	- 2.000***	0.097

NOTES: Number of Observations = 64; R^2 = 0.980; Adjusted R^2 = 0.980; F-test = 1395.532; F-test is significant at the 0.01 level.
*** Two-tailed t-tests are significant at the 0.01 level.

Seemingly Unrelated Regression Results

Given that (3) explains most of the variation in market share, it is now possible to

investigate how local economic, demographic and structural characteristics are associated with the changes in the three components of commercial banks' market share of agricultural loans in Arkansas. Initially, SUR was used on the full sample with all 75 counties to estimate (4), (5) and (6). Results indicated a general lack of significance of the three equations at the 1% and 5% levels. The R^2s of the regression equations were also low, approximately 7%, respectively, for each equation. In addition, only a few of the individual parameters were statistically different from zero. As a result of the unsatisfactory results, diagnostic procedures were performed to assess the reliability of the model. The procedures are described below.

Regression Diagnostics

In addition to identifying and eliminating outliers as discussed previously, testing procedures were carried out to detect violations in the underlying regression model assumptions. The diagnostic procedures included tests for heteroskedasticity, a regression specification error test, and assessing multicollinearity problems. See Priyanti (1993) for additional discussion of the tests and presentation of test results.

Heteroskedasticity implies the variance of the distribution of the error term is not uniform for all observations. Results of the tests for the three component equations (PCALDR, PCBD and PCTAL) indicate the null hypothesis of homoskedasticity is not rejected at the 0.01 level of significance for each regression equation. This implies that no correction need be made in the standard SUR approach to correct for heteroskedasticity.

The Ramsey RESET procedure is used to test for omitted variables. The results indicate that none of the three estimated equations (4), (5) and (6) appear to have an omitted variable at the 0.05 level.

Multicollinearity diagnostics indicated the existence of partial, but not exact, linear relationships among the explanatory variables in each of the three equations of a potentially harmful nature. There are several methods for responding to multicollinearity problems. The most direct method is to improve data conditioning through the collection and use of additional observations that provide the needed independent variation relative to the original data. However, additional observations are not available. Instead the approach was taken to eliminate one of the collinear variables. This has the potential of biasing the remaining coefficient estimates. However, the results of the RESET specification test indicate that this probably did not occur to any substantial degree.

The variable PCFI was dropped from each equation because of its collinearity with other independent variables and relatively small explanatory power. When the system of equations was re-estimated, severe multicollinearity did not appear to be a problem for the system of equations.

An alternative specification was also estimated in an attempt to obtain a better fit of the sample data. A specification was estimated with regional binary variables representing the rural coastal, delta and highland counties. However, the impact of these regions was not as significant as when Arkansas was divided simply into urban and rural counties.

Final Model Results

The testing procedures described above were performed on each of the three equations estimated by ordinary least squares. To obtain greater efficiency, equations (4), (5) and (6) with $PCFI_i$ omitted were estimated with the SUR technique using a sample with the 64 observations. The implications of the estimates of each of these equations can now be discussed.

Portfolio Decision (PCALDR)

The SUR estimates for equation (4) are shown in Table 5. The coefficient of determination (R^2) for PCALDR is 0.24. The F statistic is significant at the 0.01 significance level. Therefore, the study rejects the joint hypothesis that the independent variables do not influence portfolio decisions. In addition, all of the parameter estimates are significantly different from zero at either the 0.10, 0.05 or 0.01 significance level.

Table 5. Seemingly unrelated regression results of the estimation model (variable PCFI deleted, N=64).

Variable Name	Dependent Variables (equation)		
	PCALDR(4)	PCBD(5)	PCTAL(6)
Constant	35.134***	0.42181	−10.071***
	(10.328)	(3.2186)	(2.7802)
PCNFI	2.2022*	0.52388*	[a]
	(1.1617)	(0.30225)	
RISK	−8.9279**	[a]	[a]
	(3.9982)		
POP	2.5837***	−0.28913	0.53087**
	(0.96404)	(0.27099)	(0.23385)
PCUN	[a]	0.59311E-01	[a]
		(0.81681E-01)	
PCSIZE	[a]	[a]	0.94831E-01
			(0.15470)
PCVAL	[a]	[a]	0.25019***
			(0.88533E-01)
BANK	−4.2114*	0.50135	[a]
	(2.4503)	(0.66588)	
MSA	−46.511***	−5.1505	−10.562***
	(15.827)	(4.6517)	(3.6297)
F-test	3.344[b]	1.154	4.182[b]
R^2	0.2360	0.0901	0.2169

NOTE: Standard errors are in parentheses.
[a] Variable not included in regression.
[b] F-test is significant at the 0.01 level.
* Two-tailed t-test is significant at the 0.10 level.
** Two-tailed t-test is significant at the 0.05 level.
*** Two-tailed t-test is significant at the 0.01 level.

The parameter estimate on the percentage change in nonfarm income (PCNFI) is positive and significant at the 0.10 level. It can be argued that there should be a negative relationship between PCNFI and PCALDR. Increases in nonfarm income may indicate

increased demand for nonagricultural loans. This would yield a decrease in the agricultural loan-to-deposit ratio. In addition, commercial banks may prefer to lend more to nonfarm activities since repayment capacity is likely to increase because of increases in nonfarm income.

However, a positive relationship between PCNFI and PCALDR can be explained. Although nonfarm income increases, nonfarm income may not be growing as fast as farm income. Therefore, commercial banks may choose to lend to activities in which income grows more rapidly than income from other activities. This may be especially true for Arkansas, since average farm income grew 55.43% as compared to the 4.99% growth in average nonfarm income during the study.

PCNFI also is significantly and positively related to PCBD in equation (5) at the 0.10 level. This implies that an increase in nonfarm income is associated with an increase in bank deposits. If the best lending opportunities are in agriculture, then commercial banks would invest the additional bank deposits in farm loans, which results in an increase in the agricultural loan-to-deposit ratio.

The sign of the RISK coefficient in the PCALDR equation is unexpectedly negative and significant at the 0.05 level. Wilson and Barkley's (1988) risk variable was not significantly related to PCALDR. The negative parameter estimate on the RISK variable implies that the agricultural loan-to-deposit ratio rises with increases in relative risk of farm business income. This counterintuitive result can be explained by a number of reasons.

Arkansas is primarily characterized by rural areas that depend more on the agricultural economy than urban areas. Rural banks experience high risks in agricultural lending, primarily as a result of variability in farmers' incomes and limited opportunities for asset diversification. Since farm income growth during the study exceeded nonfarm income growth, commercial banks, especially in rural areas, may have chosen to invest in risky assets like agricultural loans because the fast growth in farm income may be associated with expected high agricultural profits.

Robison and Barry (1977) cite a survey conducted by the American Bankers Association that identified bankers' probable changes in the agricultural loan-to-deposit ratio if farm lending became relatively more risky. Only 38 of 119 bankers responding to the survey indicated a likely reduction in farm lending, and 24 bankers indicated an increase in farm lending. Cross-checking of answers for other risk responses, such as increases in interest rates, security requirements and degree of supervision of farm loans, confirms lenders responding to risk in ways other than denying loans. As an example, of the 81 bankers who would not reduce farm lending, 48 reported they would increase interest rates on farm loans as a risk response. In addition, 108 out of 119 bankers indicated they would increase security requirements on farm loans, and 111 out of 119 bankers indicated an increase in farm loan supervision. Unfortunately data regarding such commercial bank risk responses are not available for the present analysis.

The proportion of the growth in the number of farms to growth in total population (POP) in each county is used as a proxy for agricultural loan demand relative to consumer loan demand. As expected, the parameter estimate on POP is positive and statistically significant at the 0.01 level (Table 5). Thus, counties having large growth in the number

of farms relative to total population growth experienced greater growth in agricultural loan-to-deposit ratios than counties having small growth in the number of farms relative to total population growth. Bank officers and loan committees made decisions to support agricultural production in those counties. This result is consistent with the results found by Wilson and Barkley (1988) and Betubiza and Leatham (1992).

A proxy for bank competition is measured by the number of banks in each county in 1990. The parameter estimate on BANK is negative and statistically significant at the 0.10 level. This finding implies that as there are more banks in a county the agricultural loan-to-deposit ratio decreases. Counties with more banks probably experienced greater opportunities for loan diversification from 1986 to 1990 than did counties with fewer banks. Thus, banks with greater opportunities for loan diversification may have lowered their emphasis on agricultural lending.

The parameter estimate for urban areas (MSA) is negative as expected and statistically significant at the 0.01 level. This result indicates that commercial banks in urban areas increased their agricultural loan-to-deposit ratio at a much slower rate or decreased their agricultural loan-to-deposit ratio (de-emphasized agricultural lending) at a much faster rate than did commercial banks in rural areas. This is not surprising because the more urban an area, the more diverse are the lending opportunities. Thus, commercial banks are inclined to diversify from agriculture as long as diversification opportunities increase during the period. Moreover, rural banks are more likely to lend larger sums of money to agricultural activities relative to their deposits than urban banks because rural banks are more dependent on farm activities. This dependency may intensify if other rural lending opportunities diminish during the same period. Another reason for the inverse relationship between PCALDR and MSA may be that urban bank management has not maintained the level of agricultural lending expertise and commitment to agriculture as it had in the past.

Loanable Funds Availability (PCBD)

SUR estimates of equation (5) explaining variation in the second component of changes in commercial banks' market share, PCBD, indicate that the F statistic is not significant at the 0.10 level of significance (Table 5). This result implies that the data fail to reject the hypothesis that the regression coefficients are equal to zero. In addition, the individual parameters are not significantly different from zero, except for the parameter on the percentage change in nonfarm income (PCNFI). The coefficient of determination for the PCBD equation is 0.09. However, additional analysis shows that variation in PCBD explains relatively little variation in PCMS compared with PCALDR. Thus the lack of significance is not particularly troublesome for this study.

The parameter estimate on PCNFI is positive as expected and significantly different from zero at the 0.10 level of significance. Wilson and Barkley (1988) also found this relationship. This positive relationship indicates that increases in nonfarm income increase bank deposits. Therefore, it appears that nonfarm economic activity increases the availability of total loan funds, and, through the portfolio decision, nonfarm economic activity increases the supply of credit for agricultural borrowers.

Loan Market Size (PCTAL)

Results of the SUR estimation on the third component of the changes in commercial banks market share, PCTAL, indicate that the F statistic is significant at the 0.01 level (Table 5). In addition, except for the parameter on the percentage change in average farm size (PCSIZE), all of the individual parameters are significantly different from zero at either the 0.05 or 0.01 level. Also, the parameter estimates have the anticipated sign. The coefficient of determination for the PCTAL equation is 0.22.

A county's demographic composition is represented by the POP variable. The coefficient of POP is significant at the 0.05 level in explaining the percentage change of total agricultural loans outstanding. The parameter estimate on POP is positive as expected. This indicates that the greater the percentage change in the number of farms relative to the percentage change in the total population, the higher the percentage change in total agricultural loans outstanding. Relatively large decreases in the number of farms in a county indicates that the agricultural sector has become a less important part of the county's economy and that there is less demand for agricultural loans. This is not only true for the commercial banks that are going to serve agricultural loan demand but probably is also true for other financial institutions such as the FCS, FmHA and life insurance companies.

The parameter estimate on PCSIZE is not statistically different from zero, although the sign is positive as expected. The relative number of farms to total population in the county has a more significant impact on agricultural loans outstanding than does the potential average size of the farms.

The parameter estimate on the percentage change in the value of farmland and buildings (PCVAL) is significantly different from zero at the 0.01 level. The sign is positive as expected. Increases in farm land and property values are associated with higher agricultural loans outstanding. Betubiza and Leatham (1992) showed that a farm located in an area with high farm land and property values has great collateral value, and, thus, the farm can support a high level of loans. An increase in property values, *ceteris paribus*, decreases the financial risk of the firms so that lenders are likely to grant a high number of loans.

The parameter estimate for urban areas (MSA) is significantly different from zero at the 0.01 level. The result implies that urban areas had lower percentage growth in total agricultural loans outstanding than did rural areas. Urban areas are characterized by large urban financial institutions that are able to lend to many businesses in a variety of industries. Therefore, the relatively small concentration of farm loans among large urban financial institutions may reflect an opportunity for these institutions to lend to nonfarm business. This reason is supported by the evidence presented by Barkley et al. (1984) and Gilbert and Belongia (1988). Other possible explanations for the inverse relationship between PCTAL and MSA include significant levels of urban growth displace agriculture in urban counties and urban bank management may not have maintained their historical level of agricultural lending expertise and commitment.

CONCLUDING COMMENTS

The results of the study indicate that the increase in commercial banks' market share was attributable to the increase in commercial banks' agricultural portfolio, the increase in available loan funds and the decrease in total agricultural loans outstanding by other agricultural lender categories such as the FCS, FmHA, life insurance companies, individuals and others. Factors affecting these three components of percentage change in commercial banks' market share were identified as follows: percentage change in nonfarm income, growth in the number of farms relative to total population growth, agricultural asset values and regional location.

Commercial bank interest rates and loan losses relative to other lenders were not included in the models due to a lack of data. Although these variables might have explained more of the variation in the components of commercial bank market share, the statistical tests did not indicate omitted explanatory variables.

The percentage change in nonfarm income had a significant impact on the changes in the agricultural loan-to-deposit ratio as well as total bank deposits. This implies that commercial and industrial growth in Arkansas increased the availability of total loan funds for commercial banks, which increased the supply of loan funds for agricultural borrowers. Since the growth in nonfarm income was slower than farm income growth, bank management invested more money in agriculture by granting more agricultural loans. Hence, the agricultural loan-to-deposit ratio increased even though farm income was more variable than nonfarm income.

Results demonstrate that the growth in the number of farms relative to total population growth in an Arkansas county had a significant impact on the changes in the agricultural loan-to-deposit ratio as well as loan market size. This implies that structural and demographic effects have an impact on the demand for agricultural loans. In addition, the decrease in agricultural asset values was associated with decreased loan market size because less collateral was available to secure loans while increasing financial risk.

Financial institutions located in urban areas decreased agricultural lending during the study period. Possible explanations for this result include financial institutions located in urban areas had more diversified loan opportunities than their rural counterparts, urban growth crowded out agriculture, and urban banks may not have maintained the level of agricultural lending expertise and commitment to agriculture as it did in the past.

The conclusions reached in this study have important implications for policy formulation since they give insights into whether or not policies developed to ameliorate the farm sector financial stress and commercial bank industry in the United States are effective. Two such policies are The Federal Agricultural Mortgage Corporation (Farmer Mac) and the deregulatory trend toward intrastate and interstate branch banking.

The secondary markets for farm real estate and rural housing mortgages (Farmer Mac I) and FmHA guaranteed portions of operating and farm ownership loans (Farmer Mac II) diminish the dependency of commercial banks on bank deposits as a source of loan funds. To the extent that bank deposits as a source of loan funds constrain the volume of farm loans, Farmer Mac will increase commercial banks' market share of farm loans.

However, this is primarily a future consideration since most Arkansas banks currently have ample funds to make farm loans.

The deregulatory trend toward intrastate and interstate branch banking may have an impact on commercial banks' market share of farm loans. An implication of this study is that bank competition, as measured by the number of banks in a county, decreases the agricultural loan-to-deposit ratio of banks. Since intrastate and interstate branch banking may increase bank competition, banks are likely to have low agricultural loan-to-deposit ratios. Whether the amount of total farm loans granted by commercial banks will be offset by a greater number of banks is unknown. However, if the branch banks associated with large interstate banks are located primarily in urban areas, this might portend a market niche for rural commercial banks emphasizing agricultural loans in Arkansas.

This study provides evidence that a commercial bank's location, whether its home county is urban or rural, has an impact on the propensity of a commercial bank to grant agricultural loans. In urban areas, commercial banks grant proportionately fewer agricultural loans. To the extent that intrastate and interstate branch banking will be dominated by urban-based banks and their lending practices, branch banks associated with the urban banks may grant fewer agricultural loans relative to other loans in rural areas.

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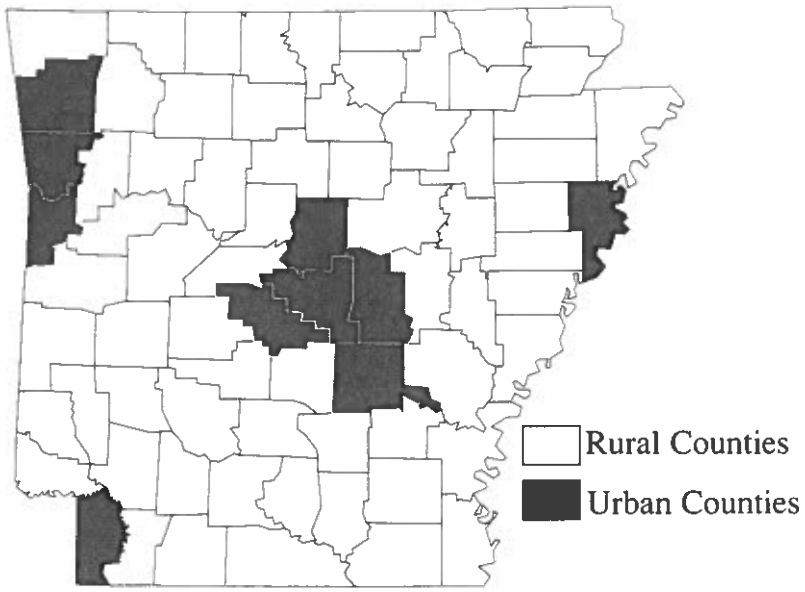
APPENDIX



Appendix Figure 1. Rural and urban counties of Arkansas.

Appendix Table 1. Descriptive analysis of the variables used (number of counties = 75).

Variable Name	Mean	Standard Deviation	Minimum	Maximum
PCALDR (%)	25.165	58.454	-89.211	258.920
PCBD (%)	1.646	12.004	-58.381	25.007
PCTAL (%)	-19.663	12.839	-47.358	13.635
PCNFI (%)	4.994	5.215	- 6.494	16.627
PCFI (%)	55.431	104.650	-49.322	461.130
POP	0.826	5.314	-24.198	18.895
PCUN (%)	-21.680	18.858	-57.480	42.574
RISK	1.096	3.818	0.005	31.712
BANK	3.413	2.201	1.000	14.000
PCSIZE (%)	2.369	9.162	-21.429	32.399
PCVAL (%)	-27.476	15.369	-52.530	21.340

NOTE: Variable name definitions are presented in Table 1.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