REPORT ON THE EFFECTS OF INDEXING INTEREST RATES ON FARM DEBT TO GROSS FARM INCOME

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Previous Research

The idea of indexing payments on farm debt to repayment ability is not new to agriculture. A Variable Amortization Plan (VAP) to manage farm mortgage risks was proposed by C.B. Baker, Professor of Agricultural Finance, University of Illinois, in 1974. The plan would index farm mortgage payments, at the farm level, with respect to prices and yields. The plan would also include the use of a mandatory debt reserve and amortization insurance. A brief description of VAP is provided below.

An income index is calculated for each year of the amortization schedule. It is calculated on the basis of prices received, prices paid, and yields. The total amount paid as expenses is divided into three categories; farm inputs, taxes, and household expenses. Weights are used to designate the proportionate share for the three types of expenses.

The income index is compared to the base period index, 100, for each year of the amortization schedule. In years when the index exceeds 100, the surplus after debt service is placed in a mandatory debt reserve. In years when the index is less than 100, debt service is paid first from available income. Next, any shortfall is paid by remaining funds from the debt reserve. The amortization insurance fund is funded by payments from the borrower and is used to make up any shortfall that is not covered by the debt reserve.

Methodology

The approach used in this study is similar to Baker's. We develop a program that would enable a borrower to reduce his/her interest expense during those years with relatively low gross farm incomes; years when a borrower can least afford to pay a high interest expense. The program would require the establishment of a mandatory reserve fund that could be used to subsidize the interest expenses paid by borrowers during those years with low gross farm income. The reduction in the reserve fund during low income years would then need to be offset by increasing the interest expense for borrowers during years with relatively high gross farm incomes; years when a borrower is in a better financial position and can better afford to pay a higher interest expense. The increase in the interest expense is necessary to provide for funding the reserve fund.

Three variables are available for adjustment when trying to achieve the results outlined above; gross farm income, the amount of debt outstanding and the interest rate charged on debt outstanding. Gross farm income is the product of production, which is a function of volume of business and enterprise selection, and prices. It is determined by weather, markets, government programs, etc., and determines the adjustment in the interest expense. The interest expense is the product of the amount of debt outstanding and the interest rate.

$$\text{Interest Expense} = \text{Debt Outstanding} \times \text{Interest Rate}$$

The amount of debt outstanding is determined by the borrower, so we cannot "adjust" debt outstanding. Therefore, the only variable that is available to adjust is the interest rate. The interest rate is then used to make the adjustment needed to index the interest rate on farm debt to gross farm income. Consequently, the interest rate must be variable and not fixed, with the variability determined by gross farm income rather than movements in the financial markets.

Our approach is different from Baker's VAP, which was at the farm level. The approach taken in this study has a state and national focus. The approach is outlined in the four steps listed below.

First, a ratio that measures the relationship between the amount of interest paid on farm debt and gross farm income is identified. The interest expense ratio is used because it provides a straightforward measure of the proportion of gross farm income used to pay the interest expense. The ratio is multiplied by 100 to convert it to a percentage. The interest expense percentage is calculated as shown below.

$$\text{Interest Expense Percentage} = \frac{\text{Interest Paid on Farm Debt}}{\text{Gross Farm Income}} \times 100$$

Second, a base level for the interest expense percentage is determined. The base level used in the study is the average annual interest expense percentage for the time period 1970-1991. This time period includes a relatively profitable period with low interest rates and increasing amounts of debt, the 1970's; and a relatively stressful period with lower profits, higher interest rates and decreasing amounts of debt, the 1980's. It also includes the time when variable interest rates were introduced, early 1970's, and the period over which the use of variable interest rates increased substantially, the 1980's.

Third, the interest expense percentage is calculated for each year during the 1970-1991 time period. The actual percentage calculated each year is compared to the base level. For years when the actual percentage is less than the base level, an amount would be paid by each borrower into a mandatory reserve fund. That amount would be the amount sufficient to increase the actual percentage to the base level. The lending institutions could act as the agents to collect the additional payments and transfer those amounts to the reserve fund. For years when the actual percentage is greater than the base level, borrowers would pay the base level and the lending institution would receive the remainder of the interest payment from the reserve fund. The amount of the payment to the sector, and ultimately to each loan account, would be the amount sufficient to reduce the actual percentage to the base level. The account for each individual borrower would be increased or decreased accordingly.

Shortfalls in the mandatory reserve fund could be funded through either a borrower paid insurance fund or a government loan. If a government loan is used, the loan would be paid from future surpluses.

Finally, it should be noted that one very important variable in this approach is the amount of debt outstanding, which is under the control of the borrower. Changes in the amount of debt outstanding can have a major impact on the mandatory reserve fund. For example, in a case where debt outstanding increases and the interest percentage of gross revenue increases, and at the same time interest rates increase, there will be a reserve fund transfer from the mandatory reserve fund to borrowers. This factor alone can keep the mandatory reserve fund in a deficit position.

Data

The data used in this study come from three sources. Those sources are listed below.

Farm Income Data: A Historical Perspective. USDA-ERS, Statistical Bulletin 740, May 1986.

Farm Sector Balance Sheet, Including Operator Households, 1960-1989: United States and by State. USDA-ERS, Statistical Bulletin 826, August 1991.

Indiana Agricultural Statistics-1991. Indiana Agricultural Statistics Service, Purdue University, 1992.

The data used in the calculations for Indiana are reported in Tables 1 and 2. The data used in the calculations for the U.S. are reported in Tables 3 and 4.

Analysis

What we do in this section is present the agricultural sector as it has evolved over the past two decades and compare it to the state of the sector as it would have existed if interest rates on farm debt had been indexed to gross farm income. The figures reported in columns 1-4 of Table 1 are the year, gross farm income, the amount of interest paid, and total farm debt, respectively. All the figures reported in columns 2-4 are for the state of Indiana and are reported in millions of dollars.

The figures reported in columns 5 and 6 are calculated by dividing the amount of interest paid (column 3) by gross farm income (column 2) and by total farm debt (column 4), respectively. In each case, the result is multiplied by 100 to convert the ratio to a percent. The figure reported in column 5 is the interest expense percentage discussed earlier. The average annual interest expense percentage for the 1970-1991 period is 9.925 percent. As can be seen by examining the figures in column 5, the interest expense percentage remained below the average for the periods 1970-1978 and 1989-1991. The 1970-1978 period was a relatively profitable time for agriculture and the 1989-1991 period is one characterized by improved earnings for the sector compared to the early and mid-1980's. The interest expense percentage remained above the average for the period 1979-1988, which was a relatively stressful period for Hoosier farmers.

The analysis will be conducted for two cases. In the first case, this average interest expense will be used as the base percent for indexing the amount of interest paid to gross farm income[1]. The figure reported in column 6 is the annual interest rate paid by farm borrowers, regardless of the source of the loan funds.

The amount reported in column 7 is the amount of interest that would need to be paid each year if 9.925 percent of gross farm income was paid as interest expense. This amount is referred to in this study as the "indexed interest expense". For example, in 1970 the Indexed Interest Expense is $175.5 million compared to the Actual Interest Paid of $107.7 million. The Indexed Interest Expense for 1970 is calculated as shown below.

$ 1767.9 (mil.) (Gross Farm Income - column 2)
x 0.09925 (Average Interest Expense Ratio for the period 1970-1991)
$ 175.5 (mil.) (Indexed Interest Expense)

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[1] Alternatively, one could use a moving average (i.e., drop the earliest year and add the most recent year). For example, the base level for 1992 could be the average annual interest expense percentage for the 1971-1992 time period rather than for the 1970-1991 period. The moving average could also be calculated for a shorter time period (i.e., 5 years, 10 years, etc.)

Table 1

INDIANA: 1970-1991

	Actual					Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9	10	11
Year	Gross Farm Income (in Mil $)	Interest Paid (in Mil $)	Total Farm Debt (in Mil $)	Interest Expense Percentage(Interest Paid + Gross Farm Income) (as a %)	Interest Rate (Interest Paid + Total Farm Debt)(as a %)	"Indexed Interest Expense" (Gross Farm Income x .09925)(in Mil $)	Reserve Fund Transactions* Col 7-Col 3 (Mil $)	Reserve Fund Account Balance (Mil $)	"Indexed Interest Rate"(Indexed Interest Expense + Total Farm Debt)(as a %)	Index Premium or Discount ( ) Col 10 - Col 6
1970	1,767.9	107.7	1,752.0	6.1	6.1	175.5	67.8	67.8	10.0	3.9
71	2,064.0	114.6	1,892.0	5.6	6.1	204.9	90.3	158.1	10.8	4.7
72	2,109.8	126.7	2,083.0	6.0	6.1	209.4	82.7	240.8	10.1	4.0
73	3,386.8	151.3	2,386.0	4.5	6.3	336.1	184.8	425.6	14.1	7.8
74	3,062.5	185.6	2,783.0	6.1	6.7	304.0	118.4	544.0	10.9	4.2
75	3,629.1	228.1	3,241.0	6.3	7.0	360.2	132.1	676.1	11.1	4.1
76	3,870.9	268.5	3,770.0	6.9	7.1	384.2	115.7	791.8	10.2	3.1
77	3,699.6	317.8	4,478.0	8.6	7.1	367.2	49.4	841.2	8.2	1.1
78	4,120.2	388.5	5,194.0	9.4	7.5	408.9	20.4	861.6	7.9	0.4
79	4,651.5	498.4	6,270.0	10.7	7.9	461.7	(36.7)	824.9	7.4	(0.5)
1980	4,755.9	599.1	6,783.0	12.6	8.8	472.0	(127.1)	697.8	7.0	(1.8)
81	4,965.3	716.2	7,380.0	14.4	9.7	492.8	(223.4)	474.4	6.7	(3.0)
82	5,031.5	789.2	7,428.0	15.7	10.6	499.4	(289.8)	184.6	6.7	(3.9)
83	4,153.1	776.4	7,423.0	18.7	10.5	412.2	(364.2)	(179.6)	5.6	(4.9)
84	5,674.6	745.7	7,273.0	13.1	10.3	563.2	(182.5)	(362.1)	7.7	(2.6)
85	5,054.0	622.3	6,521.0	12.3	9.5	501.6	(120.7)	(482.8)	7.7	(1.8)
86	4,622.2	571.6	5,703.0	12.4	10.0	458.8	(112.8)	(595.6)	8.0	(2.0)
87	4,876.4	501.3	5,112.0	10.3	9.8	484.0	(17.3)	(612.9)	9.5	(0.3)
88	4,588.2	497.7	5,004.0	10.8	9.9	455.4	(42.3)	(655.2)	9.1	(0.8)
89	5,494.3	492.5	4,926.0	9.0	10.0	545.3	52.8	(602.4)	11.1	1.1
1990	5,459.3	491.0	4,754.0	9.0	10.3	541.8	50.8	(551.6)	11.4	1.1
91	4,759.6	472.7	4,754.3	9.9	9.9	472.4	(0.3)	(551.9)	9.9	0.0

* ( ) = withdrawals from the reserve fund

The same procedure is used to calculate the "Indexed Interest Expense" for each year in the 1970-1991 time period. The results are reported in column 7.

The amount of money transferred to and from a reserve fund is reported in column 8. That amount is calculated by subtracting the "Actual Interest Paid" (column 3) from the "Indexed Interest Expense" (column 7). For example, the amount of money paid by borrowers to a reserve fund in 1970 would equal $67.8 million. That amount is calculated as shown below.

$ 175.5 (mil.) (Indexed Interest Expense - column 7)
- 107.7 (mil.) (Actual Interest Paid - column 3)
$ 67.8 (mil.) (Amount Transferred to Reserve Fund)

If indexing the amount paid for credit to gross farm income was used during the 1970-1991 period, then borrowers in the state of Indiana would have paid into the reserve fund during the 1970-1978 period and for the years 1989 and 1990; the relatively profitable years for the agricultural sector in Indiana. Conversely, borrowers would have received payments from the reserve fund during the 1979-1988 period and in 1991.

The cumulative balance for the reserve fund is reported in column 9. As can be seen by reviewing the annual balances for the 1970-1991 period, under these assumptions, the reserve fund would currently have a negative balance. The deficit could be funded from a loan from the state or Federal government, by an insurance premium paid annually by borrowers, or by a government subsidy.

The "Indexed Interest Rate" is reported in column 10. It is calculated by dividing the Indexed Interest Expense (column 7) by Total Farm Debt (column 4). The rate of 10.0 percent for 1970 is calculated as shown below.

$$10.0\% = \frac{\$175.5 \text{ (mil.) (Indexed Interest Expense)}}{\$1752.0 \text{ (mil.) (Total Farm Debt)}} \times 100$$

For example, in 1970, farm borrowers in Indiana would have paid 10.0 percent rather than 6.1 percent. The difference, 3.9 percent, which will be referred to as the "Index Premium", would have to be paid to the reserve fund. Conversely, in 1983, the interest rate paid by Indiana farmers in the aggregate would have been 5.6 percent instead of 10.5 percent. Of course, the interest expense percentage for the individual borrower would have been 9.925 percent rather than 18.7 percent calculated for the agricultural sector in Indiana.

The lending institution could administer the program for each borrower. This administration would include the collection of additional payments during years when the interest expense percentage is less than 9.925 percent and applying reserve fund payments to the loan for years when the interest expense percentage is above 9.925 percent. A reserve account balance could be maintained and monitored by the lending institution.

Further analysis of the 1970-1991 data for Indiana reveals two important findings: (1) the average interest rate for interest rates indexed to gross farm income, and the variability of those rates, is higher than for the interest rates actually paid during the period; but (2) the dollar amount of the interest expense is less variable with indexing than without. The mean or average for the interest rates indexed to gross farm income is 9.1 percent compared to 8.5 percent for the interest rates actually paid. The range, or difference between the largest and smallest values for the interest rates, is 8.5 percentage points (14.1 - 5.6) (column 10, Table 1) for indexed rates compared to 4.5 percentage points (10.6 - 6.1) (column 6, Table 1) for the actual interest rates paid. Another measure of variation is the standard deviation. The higher the standard deviation the more variable the interest rates. The standard deviation for interest rates indexed to gross farm income is 2.04 percent compared to 1.70 percent for the interest rates actually paid. However, the standard deviation for the dollar amount of interest expense is lower for interest rates indexed to gross farm income ($108.4 million) than for the actual interest expense paid ($223.8 million).

A possible effect on farm structure that could result from indexing interest rates paid on farm debt to gross farm income is an acceleration in the trend toward fewer and larger farming operations. The lower standard deviation for the dollar amount of interest expense means the use of debt becomes less risky when indexing is used compared to when indexing is not used. A less risky environment for the use of debt will likely result in an increase in the use of debt by agricultural producers. Increased debt can facilitate the trend toward fewer and larger farming operations. Thus, indexing interest rates to gross farm income could facilitate the trend toward fewer but larger farming operations in the future.

The analysis up to this point has used the average annual interest expense rate for the period as the basis for indexing interest expenses. Using this rate (9.925%) resulted in a deficit in the reserve fund. Instead of using the average rate, one could calculate the rate which would

result in a zero balance in the reserve fund. That rate is 10.526 percent. The results are reported in Table 2. The average indexed interest rate goes from 9.1 percent in the first case to 9.7 percent.

The impact on gross farm income of indexing interest rates paid on farm debt to gross farm income is illustrated in Figures 1 and 2. Gross farm income minus "interest paid" and the gross farm income minus the "indexed interest expense" are shown in Figure 1. Gross farm income minus "interest expense" and gross farm income minus the "indexed interest expense" needed to arrive at a zero 1991 balance in the reserve fund" are shown in Figure 2. As can be seen by examining both figures, the change in the level of interest rates as a result of indexing is small. However, the use of debt is less risky with indexing than without. The major determinants of net farm income are factors other than the level of interest rates (i.e., prices received, production, costs of production, amount of farm debt, etc.).

It is difficult to assess the impact of this program on an individual and on the agricultural economy, but a couple of points can be made with some degree on confidence. First, the individual borrower would pay into the reserve fund during years with high gross farm income and withdraw from the fund during low gross farm income years. Second, for the agricultural economy, during the years when payments are made into the reserve fund net farm income for the agricultural economy would be reduced. This reduction in income would result in less money being available to the sector for investment and/or consumption. The opposite effect would occur for those years when payments are made from the reserve fund.

The data for the United States are presented in Table 3. The same procedures are used to calculate the figures reported in Table 3 as are used in Table 1. The average annual interest expense percentage for the 1970-1990 period for the U.S. is 8.686 percent. The "indexed interest" expense percentage needed to have a zero balance in 1990 for the reserve fund is 9.2293. The "indexed interest expense" and "indexed interest rates" are reported on Table 4.

Table 2

INDIANA: 1970-1991

Indexed Interest Expense to Result in Zero 1991 Reserve Fund Account Balance

	Actual					Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9	10	11
Year	Gross Farm Income (in Mil $)	Interest Paid (in Mil $)	Total Farm Debt (in Mil $)	Interest Expense Percentage(Interest Paid + Gross Farm Income) (as a %)	Interest Rate (Interest Paid + Total Farm Debt)(as a %)	"Indexed Interest Expense"(for Zero 1991 Reserve Fund Balance(in Mil $)	Reserve Fund Transactions* Col 7-Col 3 (Mil $)	Reserve Fund Account Balance (Mil $)	"Indexed Interest Rate"(Indexed Interest Expense + Total Farm Debt)(as a %)	Index Premium or Discount ( ) Col 10 - Col 6
1970	1,767.9	107.7	1,752.0	6.1	6.1	186.1	78.4	78.4	10.6	4.5
1971	2,064.0	114.6	1,892.0	5.6	6.1	217.3	102.7	181.1	11.5	5.4
1972	2,109.8	126.7	2,083.0	6.0	6.1	222.1	95.4	276.5	10.7	4.6
1973	3,386.8	151.3	2,386.0	4.5	6.3	356.5	205.2	481.6	14.9	8.6
1974	3,062.5	185.6	2,783.0	6.1	6.7	322.4	136.8	618.4	11.6	4.9
1975	3,629.1	228.1	3,241.0	6.3	7.0	382.0	153.9	772.3	11.8	4.8
1976	3,870.9	268.5	3,770.0	6.9	7.1	407.5	139.0	911.3	10.8	3.7
1977	3,699.6	317.8	4,478.0	8.6	7.1	389.4	71.6	982.9	8.7	1.6
1978	4,120.2	388.5	5,194.0	9.4	7.5	433.7	45.2	1028.1	8.4	0.9
1979	4,651.5	498.4	6,270.0	10.7	7.9	489.6	(8.8)	1019.3	7.8	(0.1)
1980	4,755.9	599.1	6,783.0	12.6	8.8	500.6	(98.5)	920.8	7.4	(1.4)
1981	4,965.3	716.2	7,380.0	14.4	9.7	522.7	(193.5)	727.3	7.1	(2.6)
1982	5,031.5	789.2	7,428.0	15.7	10.6	529.6	(259.6)	467.7	7.1	(3.5)
1983	4,153.1	776.4	7,423.0	18.7	10.5	437.2	(339.2)	128.5	5.9	(4.6)
1984	5,674.6	745.7	7,273.0	13.1	10.3	597.3	(148.4)	(19.9)	8.2	(2.1)
1985	5,054.0	622.3	6,521.0	12.3	9.5	532.0	(90.3)	(110.2)	8.2	(1.3)
1986	4,622.2	571.6	5,703.0	12.4	10.0	486.6	(85.0)	(195.2)	8.5	(1.5)
1987	4,876.4	501.3	5,112.0	10.3	9.8	513.3	12.0	(183.2)	10.0	0.2
1988	4,588.2	497.7	5,004.0	10.8	9.9	483.0	(14.7)	(197.9)	9.7	(0.2)
1989	5,494.3	492.5	4,926.0	9.0	10.0	578.4	85.9	(112.0)	11.7	1.7
1990	5,459.3	491.0	4,754.0	9.0	10.3	574.7	83.7	(28.3)	12.1	1.8
1991	4,759.6	472.7	4,754.3	9.9	9.9	501.0	28.3	0.0	10.5	0.6

* ( ) = withdrawals from the reserve fund

Figure 1

GFI Net of Interest Expenses: Actual and Indexed

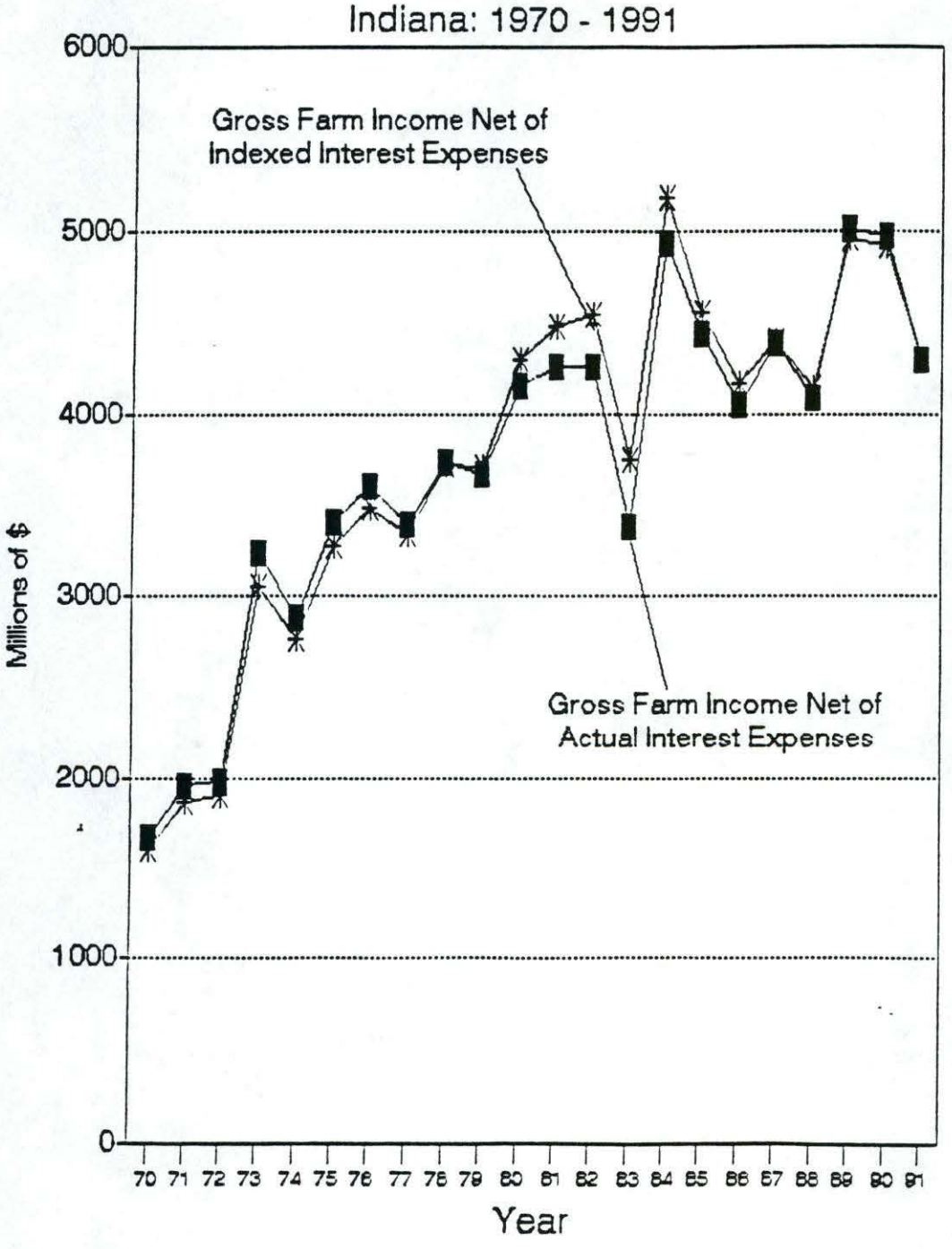

Figure 2

GFI Net of Interest Expenses: Actual and Indexed With Zero Reserve Fund Balance in 1991

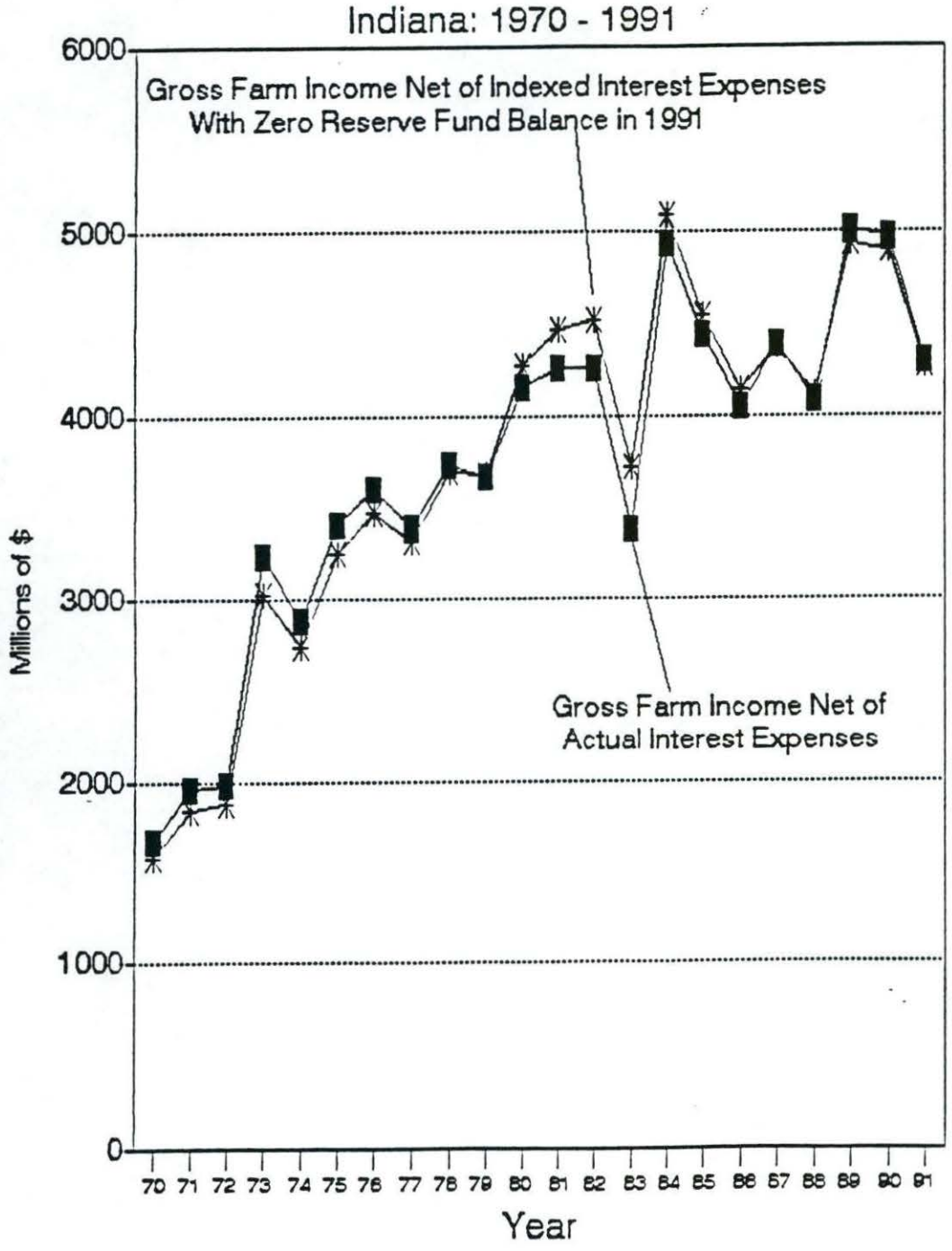

Table 3

UNITED STATES: 1970-1990

	Actual					Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9	10	11
Year	Gross Farm Income (in Mil $)	Interest Paid (in Mil $)	Total Farm Debt (in Mil $)	Interest Expense Percentage(Interest Paid + Gross Farm Income)(as a %)	Interest Rate (Interest Paid + Total Farm Debt)(as a %)	"Indexed Interest Expense" (Gross Farm Income x .08686)(in Mil $)	Reserve Fund Transactions* Col 7-Col 3 (Mil $)	Reserve Fund Account Balance (Mil $)	"Indexed Interest Rate"(Indexed Interest Expense + Total Farm Debt)(as a %)	Index Premium or Discount ( ) Col 10 - Col 6
1970	58,818	3,382.0	52,800	5.7	6.4	5,108.9	1,726.9	1,726.9	9.7	3.3
71	62,119	3,565.0	57,500	5.7	6.2	5,395.7	1,830.7	3,557.6	9.4	3.2
72	71,145	3,869.0	63,300	5.4	6.1	6,179.7	2,310.7	5,868.3	9.8	3.7
73	98,910	4,663.0	72,900	4.7	6.4	8,591.3	3,928.3	9,796.6	11.8	5.4
74	98,247	5,699.0	81,700	5.8	7.0	8,533.7	2,834.7	12,631.3	10.4	3.4
75	100,590	6,386.0	91,500	6.3	7.0	8,737.2	2,351.2	14,982.5	9.5	2.5
76	102,917	7,359.0	103,200	7.2	7.1	8,939.4	1,580.4	16,562.9	8.7	1.6
77	108,765	8,532.0	118,900	7.8	7.2	9,447.3	915.3	17,478.2	7.9	0.7
78	128,413	10,227.0	136,600	8.0	7.5	11,154.0	927.0	18,405.2	8.2	0.7
79	150,665	13,058.0	162,500	8.7	8.0	13,086.8	28.8	18,434.0	8.1	0.1
1980	149,569	16,261.0	178,700	10.9	9.1	12,991.6	(3,269.4)	15,164.6	7.3	(1.8)
81	165,967	19,864.0	195,400	12.0	10.2	14,415.9	(5,448.1)	9,716.5	7.4	(2.8)
82	161,561	21,829.0	203,100	13.5	10.7	14,033.2	(7,795.8)	1,920.7	6.9	(3.8)
83	150,623	21,430.0	206,500	14.2	10.4	13,083.1	(8,346.9)	(6,426.2)	6.3	(4.1)
84	174,026	21,129.0	204,300	12.1	10.3	15,115.9	(6,013.1)	(12,439.3)	7.4	(2.9)
85	162,911	18,613.3	187,900	11.4	9.9	14,150.4	(4,462.9)	(16,902.2)	7.5	(2.4)
86	156,078	16,498.3	166,600	10.6	9.9	13,556.9	(2,941.4)	(19,843.6)	8.1	(1.8)
87	168,470	14,953.6	153,700	8.9	9.7	14,633.3	(320.3)	(20,163.9)	9.5	(0.2)
88	174,496	14,682.2	148,500	8.4	9.9	15,156.7	474.5	(19,689.4)	10.2	0.3
89	190,293	14,690.7	146,000	7.7	10.1	16,528.8	1,838.1	(17,851.3)	11.3	1.2
1990	195,122	14,472.0	145,100	7.4	10.0	16,948.3	2,476.3	(15,375.0)	11.7	1.7

* ( ) = withdrawals from the reserve fund

Table 4

UNITED STATES: 1970-1990

Indexed Interest Expense Needed to Result in Zero 1991 Reserve Fund Account Balance

	Actual					Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9	10	11
Year	Gross Farm Income (in Mil $)	Interest Paid (in Mil $)	Total Farm Debt (in Mil $)	Interest Expense Percentage(Interest Paid + Gross Farm Income)(as a %)	Interest Rate (Interest Paid + Total Farm Debt)(as a %)	"Indexed Interest Expense" (Gross Farm Income x .092293)(in Mil $)	Reserve Fund Transactions* Col 7-Col 3 (Mil $)	Reserve Fund Account Balance (Mil $)	"Indexed Interest Rate"(Indexed Interest Expense + Total Farm Debt)(as a %)	Index Premium or Discount ( ) Col 10 - Col 6
1970	58,818	3,382.0	52,800	5.7	6.4	5,428.5	2,046.5	2,046.5	10.3	3.9
71	62,119	3,565.0	57,500	5.7	6.2	5,733.2	2,168.2	4,214.7	10.0	3.8
72	71,145	3,869.0	63,300	5.4	6.1	6,566.2	2,697.2	6,911.9	10.4	4.3
73	98,910	4,663.0	72,900	4.7	6.4	9,128.7	4,465.7	11,377.6	12.5	6.1
74	98,247	5,699.0	81,700	5.8	7.0	9,067.5	3,368.5	14,746.1	11.1	4.1
75	100,590	6,386.0	91,500	6.3	7.0	9,283.8	2,897.8	17,643.9	10.1	3.1
76	102,917	7,359.0	103,200	7.2	7.1	9,498.6	2,139.6	19,783.5	9.2	2.1
77	108,765	8,532.0	118,900	7.8	7.2	10,038.3	1,506.3	21,289.8	8.4	1.2
78	128,413	10,227.0	136,600	8.0	7.5	11,851.7	1,624.7	22,914.5	8.7	1.2
79	150,665	13,058.0	162,500	8.7	8.0	13,905.4	847.4	23,761.9	8.6	0.6
1980	149,569	16,261.0	178,700	10.9	9.1	13,804.2	(2,456.8)	21,305.1	7.7	(1.4)
81	165,967	19,864.0	195,400	12.0	10.2	15,317.7	(4,546.3)	16,758.8	7.8	(2.4)
82	161,561	21,829.0	203,100	13.5	10.7	14,911.0	(6,918.0)	9,840.8	7.3	(3.4)
83	150,623	21,430.0	206,500	14.2	10.4	13,901.5	(7,528.5)	2,312.3	6.7	(3.7)
84	174,026	21,129.0	204,300	12.1	10.3	16,061.5	(5,067.5)	(2,755.2)	7.9	(2.4)
85	162,911	18,613.3	187,900	11.4	9.9	15,035.6	(3,577.7)	(6,332.9)	8.0	(1.9)
86	156,078	16,498.3	166,600	10.6	9.9	14,405.0	(2,093.3)	(8,426.3)	8.6	(1.3)
87	168,470	14,953.6	153,700	8.9	9.7	15,548.7	595.1	(7,831.2)	10.1	0.4
88	174,496	14,682.2	148,500	8.4	9.9	16,104.8	1,422.6	(6,408.6)	10.8	0.9
89	190,293	14,690.7	146,000	7.7	10.1	17,562.8	2,872.1	(3,536.5)	12.0	1.9
1990	195,122	14,472.0	145,100	7.4	10.0	18,008.5	3,536.5	0.0	12.4	2.4

* ( ) = withdrawals from the reserve fund

The interest rates charged by various lending institutions during the 1970-1991 period are reported in Table 5. One can compare the "Indexed Interest Rate" for Indiana and the U.S. to the interest rates actually charged by lending institutions during the period studied.

Two additional points should be made about the approach used on this study. First, land financed by individuals would also be included in the plan. The only difference would be the person who loaned the money would collect money from the borrower and pay that money into the mandatory reserve fund. That person would also receive payments directly from the fund for years when there is a shortfall.

Second, the approach used in this study would be more applicable for financing an asset that has a useful life longer than one production period (i.e., machinery, breeding livestock or real estate) than for production loans. This would be necessary because of the possibility of paying into the mandatory reserve fund, during years 1 or 2, and the borrower not being in business in years 3 or 4. Hence, the collateral for the loan would need to have a useful life longer than one production period.

Impact on an Example Farm

Mr. Francis Bradley provided us a credit profile of a family farm. The data provided was for a 400-450 acre livestock and grain farm with an appraised value for farm real estate and equipment of $1,000,000. In 1979, the farm was financed by $750,000 of equity and $250,000 of debt. The amount of debt and the actual debt service was provided for the 1979-1990 time period (Table 6).

The modified VAP plan was applied to this example farm. The results are reported in Table 6. As can be seen by examining the index premium or discount (column 5), interest rate, adjustments greater than two percentage points would have occurred in only 4 years (1981-1984). The impact on the amount of interest paid each year is presented in column 8 (Reserve Fund Transactions). For example, the amount of interest paid in 1979 would have been $1,500 less with indexing than the actual payment, but in 1990 the interest payment would have been $3,928 more than was actually the case. The borrower would have had a payment from the reserve fund credited to his loan in each year during the 1979-1988 time period. The borrower would have paid into the reserve fund in 1989 and 1990. Reserve fund payments as a percentage of total interest paid for 1981, 1982, 1983, and 1984 would have be 27, 40, 56, and 27 percent, respectively. For all other years during the 1979-1988 time period less than 20 percent of the interest paid would have come from the reserve fund.

Table 5

INTEREST RATES CHARGED BY INSTITUTION: 1970-1991

		Real Estate			Non-Real Estate		
1	2	3	4	5	6	7	8
Year	Prime Rate (Large banks)	Federal Land Banks	Life Insurance Companies	FmHA	Rural Banks Farm Production Loans	Production Credit Associations	FmHA
1970	8.00	8.68	9.31	5.00	8.32	9.45	6.88
1971	5.88	7.86	8.62	5.00	8.22	7.67	6.76
1972	5.19	7.43	8.32	5.00	8.04	7.13	6.13
1973	7.56	7.48	8.62	5.00	8.22	8.00	6.32
1974	10.69	8.14	9.53	5.00	8.74	9.43	7.75
1975	8.25	8.70	10.03	5.00	9.03	9.11	8.63
1976	7.06	8.65	9.80	5.00	9.12	8.36	8.63
1977	6.63	8.35	9.29	5.00	9.18	7.93	8.00
1978	8.63	8.36	9.58	6.42	9.33	8.74	8.20
1979	12.13	9.16	10.52	9.05	10.80	10.56	9.43
1980	15.06	10.39	13.21	11.05	14.82	12.74	11.00
1981	19.63	11.27	15.42	13.00	17.87	14.46	14.04
1982	15.56	12.27	15.51	12.94	17.08	14.58	13.73
1983	10.88	11.63	12.47	10.79	14.30	11.95	10.31
1984	12.20	11.76	13.49	10.75	14.46	12.47	10.25
1985	9.92	12.24	12.60	10.75	13.52	12.40	10.25
1986	8.20	11.61	11.95	9.13	12.30	11.22	8.66
1987	8.08	11.10	10.21	8.90	11.54	10.20	8.12
1988	9.27	10.10	10.32	9.46	11.83	10.56	9.02
1989	10.95	10.93	10.78	9.46	12.86	11.73	9.10
1990	10.00	10.56	10.34	8.94	12.47	11.16	8.81
1991	8.36	9.88	9.66	8.81	11.54	10.30	8.44

Table 6

IMPACT ON AN EXAMPLE FARM OF INDEXING INTEREST RATES

ON FARM DEBT TO GROSS FARM INCOME

	Actual			Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9
Year	Total Debt	Interest Paid	Interest Rate (Interest Paid + Total Debt) (as a %)	Index Premium or Discount ( )	Indexed Interest Rate	Indexed Interest Paid	Reserve Fund Transactions	Reserve Fund Account Balance
1979	$250,000	$16,500	6.6	(0.6)	6.0	$15,000	(1,500)	(1,500)
1980	307,967	29,379	9.5	(1.8)	7.7	23,714	(5,665)	(7,165)
1981	312,083	34,959	11.2	(3.0)	8.2	25,591	(9,368)	(16,533)
1982	335,958	32,808	9.8	(3.9)	5.9	19,822	(12,986)	(29,519)
1983	432,122	37,461	8.7	(4.9)	3.8	16,421	(21,040)	(50,559)
1984	461,069	43,802	9.5	(2.6)	6.9	31,814	(11,988)	(62,547)
1985	465,083	56,391	12.1	(1.8)	10.3	47,904	(8,487)	(71,034)
1986	414,475	45,371	10.9	(2.0)	8.9	36,888	(8,483)	(79,517)
1987	378,939	38,087	10.1	(0.3)	9.8	37,136	(951)	(80,468)
1988	390,156	35,869	9.2	(0.9)	8.3	32,383	(3,486)	(83,954)
1989	369,337	39,256	10.6	1.1	11.7	43,212	3,956	(79,998)
1990	350,293	38,107	10.9	1.1	12.0	42,035	3,928	(76,070)

The reserve fund account balance (column 9) would have increased from 1979-1988 due to payments from the fund. During 1989 and 1990 a total of $7,884 would have been paid into the fund. So, in 1990 the reserve fund account balance would have been at least ($76,070). The amount owed by the borrower at the end of 1990 would have been $426,363 ($350,293 + $76,070), plus the interest that would have accrued from 1979-1990.

The impact on the example farm of indexing interest rates necessary to have a 1991 zero balance in the Indiana reserve fund account is shown in Table 7. In this case, the amount owed by the borrower at the end of 1990 would have been $403,998 ($350,293 + 53,705), plus the interest that would have accrued from 1979-1990, or $22,365 less than in the previous case.

To illustrate the impact of the amount of debt outstanding on interest paid and the reserve fund, it is assumed the total debt outstanding for the example farm remains constant during the 1979-1990 time period. So the debt outstanding for the example farm would be $250,000 for each year during the 1979-1990 time period, rather than total debt starting at $250,000 in 1979, increasing to $465,083 in 1985 and then decreasing to $350,293 in 1990. Interest rates charged are the actual rates paid. The results are presented below.

Year	Total Debt	Interest Rate	Interest Paid	Indexed Interest Paid	Reserve Fund Transactions	Reserve Fund Account Balance
1979	250,000	6.6	$16,500	$15,000	(1,500)	(1,500)
1980	250,000	9.5	23,750	19,250	(4,500)	(6,000)
1981	250,000	11.2	28,000	20,500	(7,500)	(13,500)
1982	250,000	9.8	24,500	14,750	(9,750)	(23,250)
1983	250,000	8.7	21,750	9,500	(12,250)	(35,500)
1984	250,000	9.5	23,750	17,250	(6,500)	(42,000)
1985	250,000	12.1	30,250	25,750	(4,500)	(46,500)
1986	250,000	10.9	27,250	22,250	(5,000)	(51,500)
1987	250,000	10.1	25,250	24,500	(750)	(52,250)
1988	250,000	9.2	23,000	20,750	(2,250)	(54,500)
1989	250,000	10.6	26,500	29,250	2,750	(51,750)
1990	250,000	10.9	27,250	30,000	2,750	(49,000)

Table 7

IMPACT ON AN EXAMPLE FARM OF INDEXING INTEREST RATES ON FARM DEBT TO GROSS FARM INCOME INTEREST RATE NEEDED IN INDIANA FOR ZERO RESERVE FUND BALANCE

	Actual			Indexing Interest Rates to Gross Farm Income				
1	2	3	4	5	6	7	8	9
Year	Total Debt	Interest Paid	Interest Rate (Interest Paid + Total Debt) (as a %)	Index Premium or Discount ( )	Indexed Interest Rate	Indexed Interest Paid	Reserve Fund Transactions	Reserve Fund Account Balance
1979	$250,000	$16,500	6.6	(0.1)	6.5	$16,250	(250)	(250)
1980	307,967	29,379	9.5	(1.4)	8.1	24,945	(4,434)	(4,684)
1981	312,083	34,959	11.2	(2.6)	8.6	26,839	(8,120)	(12,804)
1982	335,958	32,808	9.8	(3.5)	6.3	21,165	(11,643)	(24,447)
1983	432,122	37,461	8.7	(4.6)	4.1	17,717	(19,744)	(44,191)
1984	461,069	43,802	9.5	(2.1)	7.4	34,119	(9,683)	(53,874)
1985	465,083	56,391	12.1	(1.3)	10.8	50,229	(6,162)	(60,036)
1986	414,475	45,371	10.9	(1.5)	9.4	38,961	(6,410)	(66,446)
1987	378,939	38,087	10.1	0.2	10.3	39,031	944	(65,502)
1988	390,156	35,869	9.2	(0.2)	9.0	35,114	(755)	(66,257)
1989	369,337	39,256	10.6	1.7	12.3	45,428	6,172	(60,085)
1990	350,293	38,107	10.9	1.8	12.7	44,487	6,380	(53,705)

The mandatory reserve fund balance would still have a deficit balance, but rather than ($76,070) the deficit would be ($49,000); $27,070 or 35.6 percent lower. Of course, had the debt outstanding decreased over the time period rather than remained constant, the mandatory reserve fund would have a lower deficit.

Subsidized Credit

Although the sponsors of HR 46 stated they did not want a government "handout" or subsidy, the topic will likely be raised when this report is discussed. The amount of a government subsidy in a given year for borrowers in Indiana and in the U.S. is the amount of the deficit for the reserve fund and is denoted by the ( ) in column 9 for Tables 1-4, respectively. That amount would be the amount required each year to maintain an interest expense percentage of 9.925 percent.

Beginning Farmer and Rancher Program

The members of the three farm organizations also expressed concern that beginning farmers may not have available an adequate supply of affordable credit to purchase farm inputs and assets. However, passage of legislation at the Federal level has addressed this area of concern. The Agricultural Credit Improvement Act of 1992 establishes a new beginning farmer and rancher program that will be administered by the Farmers Home Administration. Briefly, the beginning farmer and rancher program:

- Authorizes FmHA to provide a 10-year commitment for annual operating loans to eligible individuals with not more than 5 years of experience in farming or ranching; requires that loans made during the first 4 years of the commitment period be at a reduced interest rate; sets out strict criteria for eligibility and continued loan assistance.

- Earmarks funding within FmHA's direct and guaranteed farm operating loan programs for the beginning farmers or ranchers to purchase equipment, seed, livestock and other inputs.

- Establishes a new down payment loan program for the purchase of farmland by beginning farmers or ranchers. Earmarks funding with FmHA's direct farm ownership loan program for this program. Low-interest 10-year loans are authorized in an amount up to 30 percent of the price of the land. Borrower criteria is set out for eligibility.

- Authorizes the Secretary of Agriculture to coordinate this program with state programs for beginning farmers or ranchers.

Therefore, a beginning farmer and rancher program is currently being implemented by the Farmers Home Administration.

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Appendix

Minutes of Meeting on September 11, 1992

The terminology used in the resolution was discussed and defined as follows. The term "farm credit" as stated in the authorizing resolution refers to the amount of interest paid on farm debt. The term "farm income" refers to gross farm income. Gross farm income (GFI) is used in the study rather than net farm income because interest expenses are paid from GFI and the use of GFI largely avoids differences across farming operations due to financial management abilities. The phrase "indexing of farm credit to farm income" is interpreted to mean the desire to maintain a constant relationship, across time periods, between the amount of interest paid on farm debt and gross farm income. The adjustment mechanism that would be used to maintain that relationship is the interest rate paid on farm debt. Of course, it is recognized that other adjustment mechanisms are also available to maintain that relationship such as changing the level of farm debt or gross farm income. These two mechanisms were considered to be beyond the scope of this study.

Second, the members of the three farm organizations expressed concern that the factors that affect gross farm income and the factors that affect the interest rates charged on farm debt are often unrelated. For example, a farm borrower could experience a year when gross farm income is low relative to other years, and the reason(s) for the low gross farm income could be beyond the control of the farm borrower (i.e., adverse weather resulting in low production, low commodity and livestock prices, high input costs, etc.). At the same time, the interest rate charged the borrower could be high relative to other years, and the reason(s) be beyond the control of the farm borrower and even unrelated to agriculture (i.e., actions by the Federal Reserve, an increase in interest rates across the entire economy, or other reasons not directly related to agriculture). Consequently, a farm borrower could be charged a relatively high interest rate during a year when he/she could least afford to pay that interest rate. Thus, the intent of the study is to analyze the impact of indexing interest rates to gross farm income to lessen the adverse effects of the situation described above. However, the members of the three farm organizations stated they do not want a government "hand-out" or subsidy.

Third, the scope of the study is to evaluate the relationship between interest paid on farm debt and gross farm income on an aggregate basis for Indiana and the U.S. The time period

used in the study is 1970-1991. That period includes the generally profitable decade of the 1970's and the generally stressful decade of the 1980's. Also, variable interest rates were introduced in the early 1970's, so the time period includes the time when variable interest rates were introduced and the time period when the use of variable interest rates increased.

Finally, another aspect of the problem also needs to be considered in the study, although it was not discussed at length on September 11. Lending institutions that make loans to agricultural producers must pay competitive interest rates on deposits, certificates of deposits, etc., and pay other expenses; regardless of what happens to gross farm income for a given year. Also, the interest rates charged on farm loans must provide the lending institution with an anticipated rate of return that is comparable to other lending opportunities or there is a disincentive to make loans to agriculture. If there is a disincentive to make loans to agriculture, then lending institutions could decrease the number and amount of loans to agriculture. Such actions could lead to a reduction in the amount of credit available to farm borrowers. However, it is not assumed in this study that lending institutions that make loans to agricultural producers are guaranteed a profit from those loans.