CASH FLOWS AND FINANCING IN TEXAS AGRICULTURE*

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INTRODUCTION

The rapid increase of real estate debt and nonreal estate debt outstanding in the farm sector at the national level is well documented [e.g., 2, 4, 6]. Reasons for these increases include the rapid consolidation of land ownership, continuing adoption of capital intensive technology, greater off-farm purchases of operating inputs, increases in land values, and other such factors. On the one hand the ability of the farm sector to attract this debt is encouraging. Yet, serious questions arise concerning agriculture's liquidity position, repayment capacity, and the actual performance of its finance market. Much of the increased debt came from land sellers, other individuals, and merchants and dealers. None of these are specialized lenders.

Expected increases in the future financing requirements of agriculture are also well documented [1, 3, 4, 11]. Can these future needs be efficiently met by the specialized intermediaries in the finance markets? Or, will financial institutions become outmoded with limited terms and capacity for financing and thereby adversely affect the growth and resource allocation in the farm sector?

Although some attempts have been made to assess these questions at the national level, very little attention has been given at the state level. Yet it is at the state level that answers to these questions are most crucial, owing to differing farm types and differing state regulations on the organization of leading financial institutions, particularly banks.

The purpose of this paper is to demonstrate an easily applied method for estimating historic cash flows for agriculture at the state level and to use these estimates to (1) assess the financial condition of the state's agriculture and (2) project future financing requirements.

Projections of capital and credit flows have become rather common analytical tools in financial research. At the national level such projections have arisen from simple, straight-line projections of historic trends, from more comprehensive cash flow models, and from coefficients resulting from detailed systems of equations relating cash flows to endogenous and exogenous variables. We chose a simpler method for generating projections, based on measured trends of cash flow items. Granted the quality of the data is low with this approach, still some estimate is preferred to no estimate.

DATA SOURCES

We define cash flows as the summation of financial transactions in the farm sector over an annual accounting period. The items comprising the sources and uses of cash are listed in Table 1. Short-term debt extended and repaid constituted the largest source and use of funds in the flow-of-funds tableau.

Nonreal Estate Debt

The following sources of nonreal estate debt were identified: (1) all operating banks, excluding loans held or guaranteed by the Commodity Credit Corporation; (2) Production Credit Associations; (3) Farmers Home Administration; (4) Federal Intermediate Credit Bank loans to and discounts for livestock loan companies and agricultural credit corporations; (5) other lenders including merchants, dealers, individuals, etc.

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Table 1. SOURCES AND USES OF FUNDS STATEMENT FOR TEXAS AGRICULTURE

	Million of Dollars								
	1962	1963	1964	1965	1966	1967	1968	1969	1970
SOURCES OF FUNDS:									
Cash receipts from farm marketings	2580.3	2758.2	2524.3	2714.1	2987.7	2816.9	3044.3	3503.0	3669.7
Government payments	148.5	140.2	173.5	198.8	451.7	462.2	465.4	505.2	543.2
Nonfarm income	611.5	591.8	642.0	692.4	744.3	620.5	885.4	873.5	1181.6
Real estate debt extended	250.6	332.8	441.8	454.4	413.3	393.1	417.8	434.1	401.1
Nonreal estate debt extended	2499.1	2832.7	3240.6	3501.0	3968.4	3869.2	4179.9	4744.5	5095.2
Real estate sales by active farmers	373.8	375.1	386.8	338.7	309.3	309.6	322.8	364.0	304.7
Beginning financial assets	992.2	946.6	924.6	952.2	1002.5	887.5	1096.6	1033.6	1385.3
Total Sources	7456.00	7977.4	8333.6	8851.6	9877.2	9359.0	10412.2	11457.9	12580.8
USES OF FUNDS:									
Farm operating expenses	1586.7	1613.6	1553.2	1681.8	1850.4	1947.4	2091.3	2400.1	2469.9
Capital expenditures	230.0	262.2	279.1	310.3	338.7	365.3	334.6	339.0	362.1
Repayment of real estate debt	154.4	183.9	245.7	291.6	293.3	273.6	308.7	346.7	402.6
Repayment of nonreal estate debt	2418.6	2749.4	3167.5	3450.3	3922.4	3795.9	4084.0	4587.0	5035.7
Real estate purchased by active farmers	495.9	515.7	518.8	472.7	567.9	521.5	529.1	560.0	497.1
Ending financial assets	946.6	924.6	952.2	1002.5	887.5	1096.6	1033.6	1385.3	1236.5
Proprietor withdrawals:									
Income tax	128.8	123.1	117.4	116.5	132.7	120.8	161.1	188.1	247.0
Insurance contributions	15.5	16.0	15.9	15.9	21.7	19.0	24.7	23.3	29.1
Family consumption & investments	1479.5	1588.9	1483.8	1510.0	1862.6	1218.9	1845.1	1628.4	2300.8
Total Uses	7456.0	7977.4	8333.6	8851.6	9877.2	9359.0	10412.2	11457.9	12580.8

Published data on a statewide basis are available for loans outstanding at the first of each year for lenders 1 through 4. Data on loans outstanding for lender (5) was estimated from national data by assuming the same relationship exists between noninstitutional lenders to institutional lenders in Texas as it does for the U.S. Data on loans outstanding, while not flow variables, can be used to estimate loans made (LM_t) and loans repaid (LR_t) in year t for example. This difference in loans outstanding from one year to the next (LO_{t+1}-LO_t) must equal the differences between loans made and loans repaid in the t-th year:

(1) $LM_t - LR_t = Y_t$

To solve for loans made and loans repaid, another relationship is needed in terms of LM_t and LR_t; we choose the following:

(2) $LM_t/LR_t = X_t$

Since Y_t in equation (1) is known, we need only to find estimates of X_t to solve for LM_t and LR_t. The difficulty, of course, was to find some estimating equation for X_t in terms of known information.

We hypothesized a close relationship over time between the ratio of loans made to loans repaid and percent changes in loans outstanding. This relationship is easily explained if we consider LR_t to be a constant, that is, predetermined by loan contracts in earlier periods. Thus, if the variable $\frac{Y_t}{LO_{t+1}}$ is to increase (decrease) the ratio of LM_t/LR_t must increase (decrease). Thus, in essence, we assume a unique relationship that associates with each percent change in loans outstanding a unique ratio of loans made to loans repaid, a relation that would be the same for all short-term lenders.

Loans-made data were available for nonreal estate lenders (2) and (3) and FICB's in the U.S. We solved for LR_t using the simple formula $LR_t = LO_t - LO_{t+1} + LM_t$. Thus, for three lenders at least, we knew Y_t and X_t which enabled us to test the following predictive equation for X_t

$$\hat{X}_t = \hat{\alpha} + \hat{\beta}(Y_t/LO_{t+1})$$

This equation was tested using eight years of historical data from PCA's in Texas and FICB's in the U.S. The correlation between X_t and Y_t/LO_{t+1} was extremely high for these two lenders, $R^2 = .99$ in both cases. The regression equations relating X_t to Y_t/LO_{t+1} for Texas PCA's and FICB's in the U.S. were $X_t = .994 + .005\ (Y_t/LO_{t+1})$ and $X_t = .997 + .005\ (Y_t/LO_{t+1})$, respectively.

Substituting the predicted X_t values into equation (2) gave two equations in two unknowns which yields unique solutions for LM_t and LR_t except where $X_t = 1$.[1]

To give some indication of the accuracy of estimates obtained in the procedures just described, we predicted LM_t by the PCA's in Texas and

[1] $LR_t = Y_t/(X_t-1)$ and $LM_t = Y_t + LR_t$. Note that for X_t equal to 1, the equations are not defined.

Table 2. COMPARISON OF ACTUAL AND PREDICTED LM_t VALUES FOR TEXAS PCA'S, 1962-1970

Yr.	Y_t/LO_{t+1}	X_t	$\hat{X}_t = .994 + .005(Y_t/LO_{t+1})$
62	9.4	1.044	1.044
63	10.0	1.049	1.047
64	5.7	1.021	1.025
65	-.3	.998	.992
66	8.3	1.039	1.038
67	11.4	1.055	1.055
68	12.9	1.063	1.063
69	25.5	1.134	1.131
70	10.8	1.045	1.052

	LM_t (actual value)	LM_t (using $\hat{X}$)
	millions of dollars	
62	300.2	299.1
63	324.3	330.3
64	446.1	380.5
65	336.3	64.4[a]
66	338.1	338.9
67	425.8	425.3
68	491.2	488.4
69	652.6	665.9
70	826.9	742.3

[a]The wide difference between this estimate and the true value is the result of X_t being close to one, which require a more accurate value for X_t than can be obtained from regression techniques.

compared these estimates to the actual values. The results are summaried in Table 2.

Other Data

Data on real estate debt extended was obtained directly from recordings of mortgages. Loans outstanding data was obtained from the *Agricultural Finance Review;* repayment of real estate debt was obtained by subtraction ($LR_t = LO_t + LM_t - LO_{t+1}$).

Historic data on cash receipts from farm marketings and farm operating expenses (net of intrastate livestock sales) were available from published sources as were data on government payments [10]. Data on cash receipts and farm operating expenses were adjusted to reflect measured estimates of intrastate livestock sales.[2]

Nonfarm income for Texas was estimated by assuming that the annual ratios of Texas nonfarm income to Texas net farm income were identical to the same ratio for the U.S. [7].

Financial assets (deposits, currency, savings bonds) in beginning and end-of-year inventories were treated as sources and uses of funds, respectively. Estimates of beginning and ending inventories of financial assets were obtained from multiplying the ratio $\left(\frac{\text{Net farm income Texas}}{\text{Net farm income U.S.}}\right)$ by the beginning and ending inventories of liquid financial assets for the U.S. [8]. Income tax payments and insurance contributions were estimated in the same fashion.

Farm expenditures for nonreal estate capital items in Texas were estimated from multiplying the annual ratio of

$$\left(\frac{\text{Total gross capital expenditures, U.S.}}{\text{Total depreciation and other consumption of farm capital, U.S.}}\right)$$

by the corresponding Texas data on total depreciation and other consumption of farm capital [9, 10].

[2]Data on intrastate livestock sales were estimated for 1959, 1964, and 1969, by taking the difference between the *Census of Agriculture* estimate of farmers' expenditures for purchased livestock (representing total livestock purchased) and the *Farm Income Situation* estimate of Texas farmers' expenditures for purchased livestock (representing Texas farmers' inshipments). Estimates for years not included in the *Census of Agriculture* were estimated from the three observed values.

To obtain estimates for sales and purchases of real estate by active farmers, the participants in land transactions were divided into farmers (F) and nonfarmers (NF). NF sellers include banks, estate sales, and others not employed in agriculture. F buyers were assumed to use the land in agricultural production.

Four transactions could occur between these participants in the land market

1. NF sell to NF
2. NF sell to F
3. F sell to F
4. F sell to NF

Transactions (3) and (4) are assumed to create sources of funds to the farm sector. Transactions (2) and (3) represent uses of funds by members of the farm sector. Therefore, estimates for sources and uses of funds resulting from real estate transactions were obtained by multiplying the annual percentages of buyers and sellers (using national data in the absence of state estimates) who were active farmers times the yearly total dollar volume of land transactions in Texas [11].

Estimates of family consumption in Texas were obtained as a residual to equate the sources and uses of funds.

CASH FLOW PROJECTIONS

Two types of equations were considered for predicting cash flows: a linear trend and an exponential function. A linear trend line implies equal annual increments of change in the cash flows. If the linear trend line has a positive intercept, the average percentage rate of change will decrease from year to year.[3]

An exponential model, on the other hand, allows for increases in cash flows at an increasing rate. Thus, cash flows in year t+1 could be estimated by multiplying cash flows in year t by some average percentage rate of growth $(1+\beta)$. We chose the exponential model as the basis of analysis. The problem then was to estimate $(1+\beta)$ – the average percentage rate of growth. The term $(1+\beta)$ was estimated using historic cash flows and the following equation:

(3) $\hat{Z}_t = Z_k (1+\hat{\beta})^{t-k}$

where k = 1961, t = 1962, ..., 1970 and Z_t is the value of the Z-th flow variable in the t-th year. Converting to log linear form allowed us to solve for $1+\beta$ using ordinary least squares:

(4) $\log Z_t = \log Z_k + (t-k) \log (1+\beta_c)^4$.

β_c in equation (4) is the average rate of increase in Z_t or the growth rate. Since Z_t is nondeflated, the growth rate is in current dollars and is equal to the product of the average rate of real growth $(1+\beta_r)$ and the average rate of inflation $(1+\beta_i)$. β_i is obtained by regressing the index of "prices paid by farmers" over time. This rate was found to equal 1.0304. β_r was then solved for by dividing $(1+\beta_c)$ by (1.0304).

Once β_c, β_i, and β_r were derived, we predicted 1980 values in current dollars, real dollars (where 1970 = 100), and applied alternative rates of inflation of 2%, 3 1/2%, and 5%. Results of the projections are reported in Table 3. Column 3 indicates 1980 projections in undeflated dollars assuming that historic inflation rates of 3.04% will continue. Column 4 indicates 1980 projections in deflated dollars. Columns 6, 7, and 8 indicate 1980 projections at inflation rates of 2 percent, 3 1/2 percent, and 5 percent, respectively.

The projection equations for 1980 values in real (1970) dollars, current dollars, and projections using alternative rates of inflation are given in (5), (6), and (7), respectively.

(5) $Y_{80r} = \text{Antilog} [\log Y_{61} + 9 \log (1+\beta_c) + 10 \log (1+\beta_r)]$

(6) $Y_{80c} = \text{Antilog} [\log Y_{61} + 19 \log (1+\beta_c)]$

(7) $Y_{80i} = \text{Antilog} [\log Y_{61} + 9 \log (1+\beta_c) + 10 \log (1+\beta_i) + 10 \log (1+\beta_r)]$

where i = 2%, 3 1/2%, and 5%; and where Y_r, Y_e, Y_i are projections to the 1980 in deflated dollars, current dollars, and in dollars assuming a rate of inflation i.

IMPLICATIONS OF SOURCES AND USES OF FUNDS FOR TEXAS AGRICULTURE

Estimates of sources and uses of funds in Texas agriculture for the 1962-1970 period are based on limited data, very little of which can be obtained directly from published sources. The remainder required some estimation procedures to obtain the

[3] $\frac{\Delta Y}{Y_t} > \frac{\Delta Y}{Y_{t+1}}$ where $Y_t > 0$.

[4] Note that in this form we have the classical normal linear regression model $Y = \hat{\alpha} + \hat{\delta} X + \epsilon_t$; where $\hat{\alpha} \doteq \log Z_k$ and $\hat{\delta} = \log (1+\beta_c)$. The distributional assumptions are made with respect ϵ_t. Using this transformed equation, our true model in terms of B would be:

$$Z_t = Z_k (1+\beta)^{t-k} e^{\epsilon_{t-k}}$$

Table 3. LOG LINEAR DEFLATED AND NONDEFLATED FLOW-OF-FUNDS PROJECTION ESTIMATES FOR TEXAS AGRICULTURE IN MILLIONS OF DOLLARS

	Compound rate (1)	Real rate (2)	1980 projections in current dollars (3)	Projections in deflated (1970 = 100) dollars (4)	Values from Table 1 (5)	1980 projections with col. 5 inflated annually at: (6)	(7)	(8)
SOURCES OF FUNDS:								
Cash receipts	1.0432	1.0124	5302.6	3930.9	3669.7	4791.7	5544.9	6403.1
Government payments	1.0691	1.0367	1078.0	812.4	543.2	990.3	1145.9	1323.2
Nonfarm income	1.0750	1.0433	2040.2	1548.3	1181.6	1887.4	2184.0	2522.0
Real estate debt extended	1.0417	1.0105	682.2	517.7	401.1	631.1	730.3	843.3
Nonreal estate debt ext.	1.0870	1.0550	11841.0	8989.6	5095.2	10958.2	12680.7	14643.1
Real estate sales by active farmers	.9778	.9488	248.6	188.6	304.7	229.9	266.0	307.3
Beginning financial assets	1.0316	1.0012	1571.7	1193.3	1385.3	1454.6	1683.3	1943.8
USES OF FUNDS:								
Farm operating expenses	1.0637	1.0323	4469.2	3313.1	2469.9	4038.6	4673.3	5396.6
Capital expenditures	1.0532	1.0222	641.2	486.6	362.1	593.2	686.4	792.6
Repayment real estate debt	1.1075	1.0749	1118.2	848.6	402.6	1034.4	1197.0	1382.3
Repayment nonreal estate debt	1.0882	1.0561	11768.0	8929.2	5035.7	10884.6	12595.5	14544.7
Real estate purchased by active farmers	1.0066	.9770	569.2	431.9	497.1	526.5	609.2	703.5
Ending financial assets	1.0432	1.0124	1881.4	1427.7	1236.5	1740.4	2013.9	2325.6
Proprietor withdrawals:								
Income tax	1.0787	1.0469	414.8	314.8	247.0	383.7	444.1	512.8
Insurance contributions	1.0816	1.0497	58.9	44.7	29.1	54.5	63.1	72.8
Family consumption[a]	1.0350	1.0049	1843.4	1384.2	2300.8	1687.3	1952.6	2254.9
Total flows by summation	1.0633	1.0319	22764.3	17180.8	12580.8	20943.2	24235.1	27985.8

[a]Estimated as a residual

values appearing in Table 2. In addition, errors in the published data may well exist – the most likely being an understatement in the USDA estimates of total farm receipts in Texas. Nevertheless, there is compelling evidence that Texas farmers are experiencing an increasingly deteriorating liquidity position. The 1962-70 estimates of cash flow items indicate that except for 1962, 1963, and 1968 debt repayments exceeded gross farm income. If these estimates approach reality, Texas farmers are experiencing significant loan carryover and are thus borrowing large amounts simply to repay previous debts. Most previous studies of financing flows have not been able to reflect these apparent refinancing features.

All projections of trends to 1980 indicate a substantial increase in the volume of financing and a worsening of the cash flow-liquidity position. Even with a relatively conservative inflation rate of 2 percent per year, the ratio of nonreal estate debt repayments to total cash farm income increases from .93 in 1970 to 1.42 in 1980.

Some salient trends should be pointed out with reference to growth rates calculated for Texas in Table 3. Inflation has averaged slightly over 3% for the nine years of our data sample. Little, if any, real growth has occurred in cash receipts from farm marketing; however, since the number of farms in Texas has decreased from 224,000 with an average size of 638 acres in 1962 to 187,000 farms with an average size of 775 in 1970, income from marketing receipts per farm has been increasing while receipts per acre remained nearly constant in real terms.

Meanwhile, nonfarm income and government payments have been increasing at real rates of 4.3% and 3.7%, respectively. Total cash farm income has been increasing at a real rate of 3%.

Real estate debt repayments have been increasing at a real rate of 7.5%, while real estate debt extensions have been increasing at a real rate of only 1%. Nevertheless, farm mortgage loans outstanding continued to increase over the periods.

Finally, the real rates of increase in short-term debt extended and repaid were nearly equal – 5.5%

vs. 5.6%. Again, however, nonreal estate loans outstanding increased over the period from 578,939,000 in 1962 to 1,239,181,000 in 1970 [6].

Data should be interpreted cautiously at this stage, especially in the case of real estate transactions, nonfarm income, beginning and ending financial assets and other borrowings where estimates were obtained from national data by assuming that the same relationship exists between variables for Texas as at the national level.

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