Machinery C

1975

Farm Machinery Leasing: Evaluation and Implications for Measurement of Farm Financial Structure

by

David A. Lins

Contributed Paper
1975 Summer AAEA Meetings
Columbus, Ohio
August 10-13, 1975

Session Number _____ Session Title _____

Farm Machinery Leasing: Evaluation and Implications for Measurement of Farm Financial Structure.

David A. Lins, Economic Research Service, University of Illinois

Farm machinery leasing is analyzed with respect to costs and returns, cash flows, and risk. Under certain conditions a lease may be mutually advantageous to the lessor and lessee. Failure to measure the extent of farm machinery leasing has led to distortions in measures of farm financial structure.

Leasing Farm Machinery: Evaluation and Implications for Measuring Farm Financial Structure[1/]

Introduction

Should one lease or purchase? This question has been a continuing concern of farm operators faced with decisions of acquisition and control of farm machinery.[2/] The existence of the lease versus purchase option has fostered studies, (Hopkin; Schwart; Willett and Penland), which employ the concept of the time value of money to aid in the decision process. However, these studies have focused only on the decision faced by the farm operator, the potential lessee.

On the other side of the coin, machinery dealers and financial institutions are concerned about the relative advantage of leases versus outright sales in the case of dealers and leases versus loans in the case of financial institutions. Studies by (Strauss) and (Golden and Parrish) have focused on proper evaluation of loan versus lease options for commercial banks. These studies have focused only on the decisions of the lessor.

The major purpose of this paper is to explore the lease versus purchase option not only from the point of view of the lessee, but also from the point of view of the lessor. The goal is to determine under what conditions a lease may be mutually advantageous to both parties. A secondary purpose is to explore the implications of farm machinery leasing on measurement of farm financial structure.

Investment Alternatives

There are two lease options that may exist for farm machinery, the operating lease and the financial lease. An operating lease for farm machinery is a contract in which the lease period is relatively short and the lease payments are based upon a set charge per hour, week, month, etc. A common characteristics of an operating lease is that the equipment is leased to several different operators. The financial lease for farm machinery is a long term contract in which the lessee acquires sole use of the equipment in return for lease payments. Typically the lessee pays for costs of maintenance and insurance on the equipment. Thus the financial lease is similar in nature to a credit financed sale, except the lessor maintains title to the equipment as well as to the right to charge depreciation on the equipment.

Evaluating the Potential for a Mutually Advantageous Lease

There are numerous items to consider in evaluating a lease versus purchase option. To stay within the confines of time available, discussion will be restricted to the evaluation of a financial lease versus a credit financed purchase option. Even within these narrowed confines there are many criteria of evaluation. But in the case of comparing a financial lease to a credit financed purchase most of the discussion focuses on the degree of risk for both parties, the nature of the cash flows, and the costs and returns evaluated on a net present value or internal rate of return basis.

One can best address the cost and returns question by means of a specific example. Assume a farm operator wants to acquire the use of a $20,000 piece of farm machinery with a useful life of 7 years and an estimated salvage value of $2,000. Assume also that he can purchase the equipment with the aid of loan from his bank, or alternatively the bank will purchase the

equipment and provide it to him under a financial lease. The two options are summarized below:

Option A -- Credit Financed Purchase

1. Cost of the equipment -- $20,000
2. Required down payment -- 25%
3. Interest on borrowed funds is 10% and the loan is for 4 years
4. Equal annual amortization payments of $4,732 are required at the end of each of the next 4 years.

Option B -- Financial Lease

1. Cost of the equipment -- $20,000
2. Seven annual lease payments of $3,200 are to be made and are prepaid each year.[3/]
3. Lessee acquires no residual rights in the equipment, i.e. salvage value of the equipment belongs to the lessor.
4. Investment credit and depreciation tax deductions accrue to the lessor.

Income and Cost Considerations:

Table 1 outlines the cash flows for the bank under the loan option and under two potential tax rates faced by a bank. The net after tax cash flows on the loan are $1,225 and $817 under a 22 percent and 48 percent tax bracket respectively. Discounting these cash flows to zero gives an internal rate of return on the loan of 3.12 percent if the bank pays taxes in the 22 percent tax bracket, and 2.08 percent if the bank pays taxes in the 48 percent tax bracket.

Table 2 outlines the cash flows for the farm operator under the loan option. Again the analysis is done for two different tax rates, 22 percent and 48 percent. Using the 22 percent tax rate the net after tax cash outflow

Table 1. Bank Income Analysis: Loan

$15,000 Loan @ 10% Interest

22% Tax Rate

Year	Cash Flow	Interest Income at 10%	Interest and Other Expenses at 6%[a]	Taxable Income	Tax	Net After Tax Cash Flow
0	-$15,000	-	-	-	-	-$15,000
1	4,732	$1,500	$ 900	$ 600	$132	3,700
2	4,732	1,177	706	471	104	3,922
3	4,732	821	493	328	72	4,167
4	4,732	430	258	172	38	4,436
5-7	0	0	0	0	0	0
TOTAL	$ 3,928	$3,928	$2,357	$1,571	$346	$1,225

Internal Rate of Return: 3.12%[b]

48% Tax Rate

Year	Cash Flow	Interest Income at 10%	Interest and Other Expenses at 6%[a]	Taxable Income	Tax	Net After Tax Cash Flow
0	-$15,000	-	-	-	-	-$15,000
1	4,732	$1,500	$ 900	$ 600	$288	3,544
2	4,732	1,177	706	471	226	3,800
3	4,732	821	493	328	157	4,082
4	4,732	430	258	172	83	4,391
5-7	0	0	0	0	0	0
TOTAL	$ 3,928	$3,928	$2,357	$1,571	$754	$ 817

Internal Rate of Return: 2.08[b]

a/ Interest and other expenses are computed at 6% of the loan balance outstanding. This represents the costs paid by the bank for deposits as well as the other costs of servicing the loan.

b/ The internal rate of return is that annual rate of discount which will make net ater tax cash flows equal zero. It represents the net margin earned by the bank on its investment in the loan.

Table 2. Farm Operator Cost Analysis: Loan

$15,000 Loan at 10% Interest

22% Tax Rate

Year	Cash Flow	Depreciation Sum-of-Years Digits	Interest	Salvage Value(Sale)	Investment Credit	Reduction in Taxes	Net After Tax Cash Outflow
0	$ 5,000	-	-	-	-	-	$ 5,000
1	4,732	$ 5,000	$1,500		$1,400	$2,830	1,902
2	4,732	4,280	1,177			1,201	3,531
3	4,732	3,580	821			968	3,764
4	4,732	2,860	430			724	4,008
5	0	2,140	0			471	-471
6	0	1,420	0			312	-312
7	0	720	0	$2,000		-282	-1,718
TOTAL	$23,928	$20,000	$3,923	$2,000	$1,400	$6,224	$15,704

Present value of net after-tax cash flow at: 0% opportunity cost = $15,704
10% opportunity cost = $13,861
20% opportunity cost = $12,373

48% Tax Rate

Year	Cash Flow	Depreciation Sum-of-Years Digits	Interest	Salvage Value(Sale)	Investment Credit	Reduction in Taxes	Net After Tax Cash Outflow
0	$ 5,000	-	-	-	-	-	$ 5,000
1	4,732	$ 5,000	$ 1,500		$1,400	$ 4,520	212
2	4,732	4,280	1,177			2,619	2,113
3	4,732	3,580	821			2,112	2,620
4	4,732	2,860	430			1,579	3,153
5	0	2,140	0			1,027	-1,027
6	0	1,420	0			682	-682
7	0	720	0	$2,000		-614	-1,386
TOTAL	$23,928	$20,000	$3,928	$2,000	$1,400	$11,925	$10,003

Present value of net after-tax cash outflow at: 0% opportunity cost = $10,003
10% opportunity cost = $ 9,326
20% opportunity cost = $ 8,652

is $15,704. The present value of that cash outflow ranges from $15,704 under a 0 percent opportunity cost of capital to $12,373 under a 20 percent opportunity cost of capital. If the farm operator is in the 48 percent tax bracket, then the net after tax cash outflow is $10,003. The present value of that outflow is reduced to $8,652 under a 20 percent opportunity cost of capital.

The question we wish to address here is under what conditions, if any, a financial lease might be mutually advantageous. Table 3 outlines the cash flows to the bank for a financial lease which requires 7 annual lease payments of $3,200 with each lease payment prepaid.[4/] The net after tax cash flow for the bank in the 22 percent tax bracket is $1,713. The internal rate of return for these cash flows is 2.90 percent. Thus for bank in the 22 percent tax bracket, the internal rate of return would be 0.22 percentage points lower under the financial lease specified than under the loan. For a bank in the 48 percent tax bracket the net after tax cash flow is $1,609 and the internal rate of return is 3.13 percent. For this case the financial lease would result in a net return 1.05 percentage points higher than the loan.

Table 4 outlines the farm operator cost analysis for the lease alternative. For a farm operator in the 22 percent tax bracket, the net after tax cash outflow is $17,472; $1,768 larger than for the loan. However, if one accounts for the time value of money, the lease is $152 better at a 10 percent opportunity cost of capital and $1,068 better at a 20 percent opportunity cost of capital. If the farm operator is in the 48 percent tax bracket the financial lease is better only at the 20 percent level of opportunity cost.

Table 3. Bank Income Analysis: Lease

Tax Rate 22%

Year	Cash Flow	Interest and Other Expenses @6%[a/]	Depreciation Sum-of-Years Digits	Salvage Value	Investment Credit	Taxable Income	Tax	Net After Tax Cash Flow
0	-$20,000	-	-	-	-	-	-	-$16,800
	3,200							
1	3,200	$1,008	$ 5,000		$1,400	-$2,808	-$2,018	4,210
2	3,200	876	4,280			-1,956	-430	2,754
3	3,200	737	3,580			-1,117	-246	2,709
4	3,200	589	2,860			-249	-55	2,666
5	3,200	433	2,140			627	138	2,629
6	3,200	266	1,420			1,514	333	2,601
7	0	90	720	$2,000		4,390	966	944
TOTAL	$ 2,400	$3,999	$20,000	$2,000	$1,400	$ 401	-$1,312	$ 1,713

Internal Rate of Return: 2.90%

Tax Rate 48%

Year	Cash Flow	Interest and Other Expenses @6%[a/]	Depreciation Sum-of-Years Digits	Salvage Value	Investment Credit	Taxable Income	Tax	Net After Tax Cash Flow
0	-$20,000	-	-	-	-	-	-	-$16,800
	3,200							
1	3,200	$1,008	$ 5,000		$1,400	-$2,808	-$2,748	4,940
2	3,200	876	4,280			-1,956	-939	3,263
3	3,200	737	3,580			-1,117	-536	2,999
4	3,200	589	2,860			-249	-120	2,731
5	3,200	433	2,140			627	301	2,466
6	3,200	266	1,420			1,514	727	2,207
7	0	90	720	$2,000		4,390	2,107	-197
TOTAL	$ 2,400	$3,999	$20,000	$2,000	$1,400	$ 401	-$1,208	$ 1,609

Internal Rate of Return: 3.13%[b/]

a/ Interest and other expenses are computed at 6% of the funds the bank has invested in the leased machinery. At any point in time this can be calculated as: Initial investment + interest and other expenses less lease payments received.

b/ The internal rate of return is that annual rate of discount which will make net after tax cash flows equal zero. It represents the net margin earned by the bank on it's investment in the leased machine.

Table 4: Farm Operator Cost Analysis: Lease

Tax Rate 22%

Year	Cash Flow	Tax Deductible Expense	Reduction in Taxes	Net After Tax Cash Out Flow
0	$ 3,200	-	-	$ 3,200
1	3,200	$ 3,200	$ 704	2,496
2	3,200	3,200	704	2,496
3	3,200	3,200	704	2,496
4	3,200	3,200	704	2,496
5	3,200	3,200	704	2,496
6	3,200	3,200	704	2,496
7	0	3,200	704	-704
TOTAL	$22,400	$22,400	$4,928	$17,472

Present value of net after-tax flow at: 0% opportunity cost = $17,472
10% opportunity cost = $13,709
20% opportunity cost = $11,305

Tax Rate 48%

Year	Cash Flow	Tax Deductible Expense	Reduction in Taxes	Net After Tax Cash Out Flow
0	$ 3,200	-	-	$ 3,200
1	3,200	$ 3,200	$ 1,536	1,664
2	3,200	3,200	1,536	1,664
3	3,200	3,200	1,536	1,664
4	3,200	3,200	1,536	1,664
5	3,200	3,200	1,536	1,664
6	3,200	3,200	1,536	1,664
7	0	3,200	1,536	-1,536
TOTAL	$22,400	$22,400	$10,752	$11,648

Present value of net after tax flow at: 0% opportunity cost = $11,648
10% opportunity cost = $ 9,659
20% opportunity cost = $ 8,306

Table 5 summarizes the financial outcomes of the lease versus purchase option for alternative tax rates and opportunity costs of capital. Clearly, the lease may be mutually advantageous when the bank is in the 48 percent tax bracket and the farmer is in a low tax bracket and has a high opportunity cost of capital. The implications are that financial leases are more likely to be offered by "large" banks than "small" banks because the large banks would be more likely to be in the 48 percent tax bracket. Likewise, financial leases are more likely to be accepted by a farm operator whose operation is growing rapidly and whose opportunity cost of capital is high.

It should be recognized that the financial outcomes previously discussed are strongly influenced by the lease payment selected for the analysis. The lease could be made more (less) advantageous to the bank (farm operator) by raising the annual lease payments. In practice, tax advantages gained by the lessor are not often passed on to the lessee in the form of lower lease payments. However, cooperative agencies, such as Production Credit Associations, could be expected to pass potential tax advantages to their member borrowers in the form of lower lease payments.

Cash Flows:

In comparing the cash flows for the farm operator, the loan alternative requires relatively greater cash outlays at the start of the investment period. Consequently, the lease alternative could provide a more desirable cash flow situation, especially to young operators or others facing a tight cash position. However, much of the potential cash flow advantage of the lease could be offset by a loan which more accurately tied loan payments to the useful life of the equipment.

For the bank, the cash flows for either the lease or loan are a constant stream, but the loan alternative results in a recapture of the investment much more rapidly.

Table 5: Summary of Internal Rates of Return and Net After Tax Cash Flows for Alternative Tax Rates and Opportunity Costs.

Participant	Tax Rate			
	22%		48%	
	Loan	Lease	Loan	Lease
Bank:		(percent)		
Internal Rate of Return	3.12	2.90	2.08	3.13
Farmer:				
Net After Tax Cash Outflow		(Dollars)		
Opportunity Cost = 0%	15,704	17,472	10,003	11,648
Opportunity Cost = 10%	13,861	13,709	9,326	9,659
Opportunity Cost = 20%	12,373	11,305	8,652	8,305

An important concern for the bank is the "multiplier effect" of their investments. Investments, either through loans or leases, create economic activity in the community and this in turn can lead to greater deposit growth and further expansion. The question is whether the "multiplier effect" is the same for the lease as for the loan. Initially, both the lease and loan generate the same level of economic activity, since they both result in the purchase of the machine. But the loan investment is recaptured more rapidly and additional lending could result in greater "multiplier effect" because of the more rapid turnover of investment funds on the part of the bank. However, the "multiplier effect" would depend upon what farm operators do with the difference in amounts repaid to the bank under the lease versus the loan.

Risk:

Risk faced by the farm operator is changed in several respects under the lease. First there is a risk that the financial lease might be considered a conditional sales contract by the Internal Revenue Service.[5/] Such a ruling would cause the transaction to be considered a credit financed purchase thereby negating the potential cost advantages of the lease. Second, the risk associated with salvage value is altered. By nature of the amount of lease payments, the operator is in effect guaranteed a set salvage value. Thus the risk of a higher or lower salvage value than initially anticipated is shifted to the lender. Third, for farm operators with cash flow problems the cash flow pattern offered by the lease may reduce the risk of default. Fourth, the lease could reduce flexibility for the farm operator because the loan is of a shorter duration and prepayment of the loan without penalty may exist.

Risk is also altered for the bank. A financial lease could alter risk for the bank because a lease payment obligation does not have the same priority that debt has in a bankruptcy case. Another risk alluded to earlier is the risk associated with estimating salvage value, a risk the bank undertakes. In addition the bank would need to be concerned with specifying conditions of maintenance, particuarly near the termination date of the lease. Unless specified in the lease, the lessee has little incentive to undertake normal maintenance and repair near the end of the lease period. Like the farm operator, the bank also faces the risk of the contract being considered a conditional sales contract. To effectively analyze a lease versus loan option both the lessor and lessee must consider cost and income values, cash flows and the degree or risk involved.

Implications for Measuring Farm Financial Structure

What is the overall importance of farm machinery leasing? Evidence to answer this question is fragmentary. (Barry and Sutton) found that, for a sample of machinery dealers in Texas, over 45 percent offered operating and/or financial lease alternatives. They also found that "lease-purchase methods of financing" accounted for close to 3 percent of all machinery sales. A study by (Barlass) of Northern Illinois extension specialists found that 65 percent of the respondents indicated tractors were being leased in their areas.

Fragmentary evidence is of limited value in assessing the overall impact of farm machinery leasing on financial structure of the farm sector. Recognition of this potentially important source of equity capital in agriculture is now needed.

The Census of Agriculture for 1974 asks "What is the estimated market value of all machinery, equipment, and implements usually kept on this

place and used for the farm or ranch business?" Thus Census estimates of the value of farm machinery include the value of all farm machinery located on farms including any which is controlled by an operating or financial lease. Thus distinctions between owned machinery and leased machinery are not available through Census of Agriculture data.

The lack of information on the extent of farm machinery leasing creates problems in macro analyses of farm financial structure. Estimates of operator equity capital being used in farming operations are distorted. In addition, studies which relate either the value of machinery stocks or capital purchases to operator debt and/or financial assets are distorted. These distortions arise because leased machinery is not a part of the stocks of capital owned by operators nor is it considered a capital purchase by farm operators. Unless changes are made to our data system, these distortions will grow or decline in direct correspondence with the growth or decline of machinery leasing.

Footnotes

[1] This work has inspired in part by somewhat similar efforts of Charles Bennett of the Federal Intermediate Credit Bank of St. Louis.

[2] Another alternative is custom hiring the services to be performed, but that alternative is not discussed here.

[3] The payment of $3,200 represents an annual payment equal to 16.0 percent of the original cost of the equipment.

[4] The analysis in Table 3 is set up such that the first payment is made at the initiation of the lease, and the second payment at the start of the second year, etc. However, except for computing taxable income, figures in Tables 3 and 4 are calculated such that the second payment is discounted at the end of year one rather than at the end of year two.

[5] Tax regulations regarding financial leasing are quite complex. A good discussion is available in various Internal Revenue Service publications.

References

Barlass, M. T., "Trends and Terms of Farm Equipment Leasing in Illinois," unpublished term paper, University of Illinois, Urbana, Illinois, 1975

Barry, Peter J. and James W. Sutton, "Financing Farm Machinery: The Role of Retail Dealers in Texas." Departmental Information Report No. 75-2. Texas A & M University, College Station, Texas, 1975.

Golden, Raymond L. and Karl M. Parrish, "Leasing and Banks" Journal of Commercial Bank Lending, March 1974.

Hopkin, John A., "Leasing Versus Cash Purchase Versus Credit Purchase of Depreciable Assets," AET-7-70 Department of Agricultural Economics, University of Illinois, Urbana, 1970.

Schwart, R. B. "Farm Machinery Economic Decisions, Circular 1065, University of Illinois, Urbana, 1972.

Strauss, Lee E., "Leveraged Lease Analysis: Some Additional Considerations" Journal of Commercial Bank Lending, January, 1974.

Willett, Gayle S. and Robert N. Penland, "The Impact of Federal Income Taxes on the Decision to Lease or Buy Farm Machinery, Journal of the American Society of Farm Managers and Rural Appraisers, April, 1975.