TRADE CREDIT POLICIES AND RECEIVABLES MANAGEMENT FOR THE FERTILIZER INDUSTRY

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CHAPTER I

INTRODUCTION

Most farm input dealers offer various services to farm firms in conjunction with the sale of products such as feed, seed, fertilizer, fuel, and other farm supplies. Examples of services offered include financing, delivery, feed mixing, soil and feed analysis and fertilizer application. The dealer incurs a cost to provide a service. A return from the service may be obtained directly through a charge or indirectly through increased profits from additional sales. However, for some dealers, the cost of providing the service may not be covered by either a direct charge or additional profits. Due to a lack of knowledge concerning this cost, competition among dealers may induce some dealers to offer various services when returns from offering the services are less than the cost of providing them.

Dealer financing is one service offered to farm firms by most sellers of farm firm inputs. A dealer finances a customer's purchase when he exchanges his merchandise or services for the buyer's promise to pay at a future date.[1] The buyer's credit is substituted for cash on the date of sale as the medium of exchange in a merchandising transaction. However, unlike money, the buyer's credit is of limited acceptance.[2] Some input dealers sell only for cash on the date of purchase. Other dealers who finance their customers' purchases have the right to set the terms under which they will accept a buyer's credit.

Credit is defined as the "power to sell debt".[3] As defined, credit is a resource which is often exchanged at a financial institution for a loan of money. The money obtained may be exchanged for goods and services. This type of credit is financial or cash credit. Alternatively, credit may be exchanged directly for goods and services sold by dealers or suppliers. This type of credit is trade credit. Specifically, trade credit is the power to exchange a promise of future payment for merchandise or services.[4] Although trade credit itself is intangible, credit instruments provide tangible evidence of a buyer's credit outstanding (i.e. debt).[5] Credit instruments most frequently utilized by farmers to obtain financing from input dealers are open accounts and promissory notes.

Agricultural Trade Credit

Magnitude of Trade Credit Used

The quantity of trade credit used by farm firms is difficult to measure. The amount of debt held by institutional lenders such as commercial banks, Production Credit Associations, Federal Intermediate Credit Banks, and Farmers Home Administrations is estimated based on periodic reports furnished by the various lenders. However, the amount of farm debt outstanding to merchants, dealers, individuals and other miscellaneous lenders is estimated from very limited data. Such estimation is difficult because (1) the farmer's credit is exchanged for merchandise or services rather than cash, (2) dealers finance their customers' purchases for various lengths of time ranging from a few days to several months, and (3) the timing of farm input purchases is subject to both seasonal and annual fluctuations.[6]

The importance of dealers as financiers of farm input purchases is evidenced by several studies and sources of data. A study by Morelle, Hesser, and Melichar based on data from the 1960 Sample Survey of Agriculture indicated that nearly 60 percent of the farm operators having unpaid non-real estate debt obtained their production loans from merchants or dealers. Forty-three percent of the farmers were indebted to commercial banks and 11 percent had debt outstanding to Production Credit Associations. The study also indicated that farm operators owed approximately 22 percent of their total non-real estate loans to merchants and dealers. They obtained 39 and 16 percent of their debt from banks and Production Credit Associations, respectively.[7]

The Balance Sheet of the Farming Sector provides additional information concerning the role of input dealers in supplying farm non-real estate debt. Table I shows the quantity and percentage of the total farm non-real estate debt outstanding to both reporting and non-reporting creditors for specified years. The non-reporting creditors include merchants, dealers, individuals and other miscellaneous leaders. As of January 1, 1960, the total farm non-real estate debt amounted to $11,522 million. Approximately $4,860 million (42 percent of all farm non-real estate debt) was owed to all non-reporting creditors.[8] Based on the Morelle, et. al. study, over 65 percent of the debt held by non-reporting creditors was owed to merchants and dealers.[9] Thus, merchants and dealers held approximately $3,159 million or 27 percent of the total non-real estate debt. Banks and Production Credit Associations held 42 and 12 percent of the debt, respectively. Since 1960, dealers, individuals, and other miscellaneous lenders have continued to account for over 40 percent of the total farm non-real estate debt. Despite

TABLE I

NON-REAL ESTATE DEBT OUTSTANDING, UNITED STATES, JANUARY 1, SPECIFIED YEARS (1960-1971)[a]

Year	Debt Owed to Reporting Institutions[b]					Debts to Non-Reporting Creditors[d]	Total Non-Real Estate Debt
	All Operating Banks	PCA	FICA[c]	FHA	Total		
1960 Million $	4,814	1,361	90	397	6,662	4,860	11,522
Percent	41.8	11.8	.8	3.4	57.8	42.2	
1965 Million $	6,975	2,277	125	642	10,019	7,110	17,129
Percent	40.7	13.3	.7	3.8	58.5	41.5	
1970 Million $	10,318	4,495	218	783	15,814	11,230	27,044
Percent	38.2	16.6	.8	2.9	58.5	41.5	
1971 Million $	11,090	5,295	220	793	17,398	12,340	29,738
Percent	37.3	17.8	.7	2.7	58.5	41.5	
				Percentage Change			
1960-65	44.9	67.3	38.9	61.7	50.4	46.3	48.7
1965-70	47.9	97.4	74.9	22.0	57.8	57.9	57.9
1970-71	7.5	17.8	.9	1.3	10.0	10.0	10.0

[a]For 48 states.

[b]Excludes Commodity Credit Corporation Loans.

[c]Loans to and discounts for Livestock Loan Companies and Agricultural Credit Corporations.

[d]Estimate of short and intermediate term farm loans outstanding from merchants, dealers, individuals, and other miscellaneous lenders.

Source: U.S. Department of Agriculture, Balance Sheet of the Farming Sector, Agr. Info. Bulletin No. 356, Washington, 1971, p. 18.

the growth in the magnitude of farm debt supplied by specialized financial institutions, the estimated dollar amount of debt held by non-reporting creditors has increased at nearly the same percentage rate as total non-real estate debt.[10] In 1971, the total non-real estate debt was $29.7 billion, a 10 percent increase over 1970.

Other studies have evaluated the importance of input dealers as a source of production financing in terms of the proportion of annual farm production expenditures financed. A 1959-1960 survey of farmers in three counties of Montana indicated that 92 percent of the farmers questioned utilized borrowed capital to purchase production inputs. Of those farmers using credit, 95 percent used dealer financing. Dealers supplied approximately 21 percent of the total production loans.[11] A later study (1966) reported that farmers in three counties of North Dakota obtained credit to finance 48 percent (excluding 30-day merchant and dealer credit) of their production expenses. Merchants and dealers supplied 41 percent of the total external financing compared to 36 and 21 percent for banks and Production Credit Associations, respectively.[12]

The North Dakota Study also examined the importance of merchants and dealers as financiers of various production inputs. As indicated in Table II, over 50 percent of the purchase cost for petroleum products, fertilizer, and feed was borrowed from lenders. Dealers furnished financing for approximately 96 percent of the petroleum products and 86 percent of the fertilizer purchased with credit. In addition, they financed over 50 percent of the credit purchases of repairs, seed, insecticides, and farm supplies.[13]

TABLE II

PERCENT OF AVERAGE COST OF FARM PRODUCTION EXPENDITURES FINANCED AND THE PERCENT OF CREDIT PURCHASES FINANCED BY DEALERS, NORTH DAKOTA (THREE COUNTIES), 1966

Expense	Percent of Average Cost Financed	Percent of Credit Purchases Financed by Dealers[a]
Petroleum Products	71	96
Fertilizer	57	80
Repairs	48	86
Feed	53	33
Seed	33	79
Insecticides and Sprays	42	82
Buildings and Materials	39	23
Farm Supplies	16	63

[a]Excludes 30-day merchant and dealer financing.

Source: Fred R. Taylor and Hilmer Huber, Merchant-Dealer Credit in North Dakota, Part I: Farmer Use and Importance, Agricultural Economics Report No. 62, North Dakota State University, Fargo, North Dakota, April 1969, pp. 27-34.

Why Farmers Use Credit

A 1949 study of merchant and dealer credit in Vermont concluded that, in general, financing obtained from dealers is expensive and buyers should avoid its use except when it can be justified as a convenience.[14] As evidenced in recent years by the proportion of input purchases financed by dealers and the growth in farm debt owed to

merchants and dealers, this earlier credit philosophy has not been followed by farmers. Input dealers provide a convenient source of borrowed capital for farmers. Their loan is in the form of inputs rather than cash. Thus, the farmer may avoid contacting both the banker and the dealer when purchasing production inputs.

In addition to the convenience of obtaining dealer financing relative to other sources, there are other major factors which induce farmers to obtain production financing from dealers. Rising farm production expenditures combined with the seasonality in the timing of cash receipts have increased the need for external financing from all sources. The increase in farm production expenditures can be partially attributed to the implementation of farm technology.[15, 16, 17, 18] The additional employment of labor saving machines, new production methods and yield increasing inputs has increased the quantity of purchased inputs used relative to the use of non-purchased inputs. While the index numbers for the quantity of all farm inputs employed rose only moderately (4 percent) from 1950 to 1966, the index for the quantity of purchased inputs increased 31 percent. The index for the quantity of non-purchased inputs decreased nearly 32 percent.[19] Since 1966, further increases have occurred in the quantity of feed, fertilizer, and other inputs purchased.

The increased production expenditures can also be attributed to inflation and rising costs in the non-farm economy. The index of prices paid by farmers increased nearly 33 percent from 1950 to 1965 and 63 percent from 1950 to 1970.[20] The results of these and other changes have increased the need for funds to pay production expenditures.

Farm production expenditures must be financed either internally out of farm income and depreciation allowances or externally with the use of credit. The amount of financing procured from lending institutions, dealers and other sources thus depends on both the level of production expenditures and the amount of income available to finance the expenditures internally.[21, 22]

Data from the Farm Income Situation published by the USDA indicate that production expenditures amounted to $40,867 million in 1970 which is 110 percent greater than in 1950. Since 1950, gross farm income has risen nearly 72 percent. However, as a result of the rapidly increasing expenditures, net farm income expressed as a percent of gross farm income declined from 41.3 percent in 1950 to 28.1 percent in 1970.[23]

Further decreases in the ratio of net income to gross farm income due to rising production expenditures are likely to require that farmers acquire additional external financing. Several studies project that both capital and credit needs of farmers in 1980 will be well above current levels.[24, 25] Brake estimated that the average non-real estate debt needed per farm in 1980 will be more than three times the 1965 level.[26] There is some question as to whether or not the present banking system can supply the projected non-real estate debt needs of farmers.[27, 28, 29]

It seems likely that input dealers will continue to supply a significant proportion of the farmers' operating debt capital needs. Input dealers sell a large share of the farmers' operating inputs. Fertilizer, seed and feed expenditures increased 125, 35 and 97 percent, respectively since 1960. In 1970, the annual operating expenditures (current production expenses) were 68 percent of total production expenditures.[30]

Another factor inducing farmers to use credit to finance their production inputs is the changing attitude of farmers toward debt aversion. The debt-free land ownership goal may not be as important today, especially if it limits firm growth.[31] Farmers may be more concerned with the productivity of borrowed capital than with the total amount of debt they owe. The financing obtained from dealers may be an additional source of leverage for farm firms. Leverage is valuable because it can enhance the speed of firm growth. Leverage is gained by increasing debt relative to equity. The farmer may gain access to a larger amount of debt capital by using a combination of both trade and cash credit to finance production. However, the leverage provided through the use of credit generates a cost by reducing the amount of credit a firm holds in reserve.[32]

Also, the dealer may be a cheaper source than institutional lenders for production input financing. The farmer usually incurs a cash cost in the form of interest when he borrows from institutional lenders. The input price plus the interest charge is the relevant total cost of an input purchased with financial credit.[33] On one hand, if an input dealer offers financing, but provides no cash discount for an early payment nor charges a fee, the farmer pays no explicit interest cost when he purchases merchandise with dealer credit. Thus, unless the price of the input includes a hidden price to cover credit costs, dealer financing is cheaper than financing from institutional lenders. Although the farmer may need to borrow from another source after the payment to the dealer is due, he does incur an interest savings for the period of time from the purchase date to the time he must borrow from another lender. On the other hand, if the dealer makes a charge above the

price of the input for financing, he may be an expensive source of debt capital for the farmer.

Finally, dealers may offer more lenient payment terms or collection policies than other lenders. This factor was listed by North Dakota farmers as one of the important reasons for using dealer financing.[34] A longer period of time to pay for inputs increases the interest savings for the farmer. If a farmer knows the dealer will not ask for the payment of production inputs until the time when cash receipts are obtained, he is induced to use trade credit rather than financing from other sources.

Why Input Dealers Accept Credit

Trade credit exists because both the farmer who exchanges credit for merchandise and the dealer who accepts the farmer's credit expect to gain from the transaction.[35] The primary reason input dealers offer financing is for sales promotion.[36] Input dealers accept credit as a medium of exchange because it helps to increase the quantity of feed, seed, fertilizer, machinery, and other supplies sold to farmers. Most dealers feel that it is necessary to finance sales in order to secure a large volume of business from farmers. If a buyer does not have cash available when production inputs are needed, then in order to purchase the inputs he must acquire external financing. If the dealer's credit policy offers the farmer more convenience and/or smaller interest costs than offered by institutional lenders, the farmer will likely obtain some financing from the dealer.

The pressure of competition provides an incentive for the dealer to promote his products. Financing provides the dealer with one method

of differentiating his inputs from the same type of input sold by competitors.[37] Also, financing may substitute for other competitive efforts.[38] A more lenient credit policy may increase a dealer's sales quantity in a similar manner as a lower price. But, non-price competition may create less retaliation from competitors. The financing may also make possible reduced expenditures for advertising, sales promotion and services other than financing.

Furthermore, many manufacturers of farm inputs who have high fixed costs are induced to promote their sales.[39] If the manufacturer gives a retail dealer time to pay for purchases, the total sales quantity of the input will likely be enhanced. The manufacturer's fixed costs are spread over a larger volume of sales, thus reducing his average fixed costs and increasing the profit margin per unit on all units sold. Also, if the retail dealer does not have to pay for the financing he obtains from the manufacturer, he is more likely to accept the farmers' credit in exchange for inputs.

Dealer financing can also be used to reduce the seasonality in the timing of input sales. By offering a credit arrangement to induce the farmer to purchase inputs in advance of the time of use rather than during peak business seasons, the dealer can more efficiently use hired labor and inventory facilities.

In addition to the possible gains from financing due to sales promotion, dealers may also accept credit from their customers because they expect to receive an interest payment above the price of the input for providing the service. An example is a farm machinery supplier who finances the majority of credit sales with formal contracts requiring an interest payment from the buyer.

Dealer Management of Financing Activities

According to Baker, Leuthold and Seitz, one of the functions required to effectively manage the firm's financing activities is the choice among alternative methods of extending trade loans.[40] The manager should be aware of which alternative credit arrangements are available and the effect of each upon his sales and costs. Several studies indicate which arrangements dealers are presently using to finance their sales.

The types of credit instruments used by various input dealers are discussed in a study of merchant credit in Montana. The study indicated that farm machinery dealers usually finance their equipment sales using a formal contract, promissory note or conditional sales contract. Repairs and parts were sold on credit using 30-day accounts. However, the average time sales remained unpaid was 74 days. Sellers of petroleum products offered more liberal terms. Accounts were outstanding for an average of 185 days. Seed, feed, fertilizer and chemical dealers had 91 percent of their credit sales on open account and 9 percent on notes.[41]

A 1967 study (North Dakota) investigated the proportion of a dealer's total sales which were financed with alternative credit policies. The results of the study indicated that dealers financed 77 percent of their sales (see Table III). Extended open account arrangements were utilized more frequently than other arrangements.[42]

Another recent study analyzed financing by hog feed dealers in central Illinois. One of the objectives of this study was to analyze the relationship which existed between a dealer's financial management practices and the timing of customer payments. The payment performance

was measured by days sales in accounts receivable and the percent of accounts receivable that are less than 30 days old. The results suggested that both cash discounts and shorter payment due dates were effective in reducing the average days sales in accounts receivable. Firms that had shorter payment due dates also had a larger percent of accounts less than 30 days old. Also, those firms using a service charge on overdue accounts had a larger percent of accounts less than 30 days old, provided that the service charge was established early.[43]

TABLE III

PERCENT OF DEALER'S SALES FINANCED WITH ALTERNATIVE CREDIT POLICIES, 333 DEALERS, NORTH DAKOTA, 1967

Type of Credit		Percent of Total Sales
Open Account Credit[a]		14
Extended Open Account Credit		
Carried 30-90 Days	17	
Carried 90 Days - 1 Year	19	
Carried More than 1 Year	4	
Total Extended Open Account Credit		40
Formal Contract Credit		23
Total Credit		77
Cash Sales		23

[a]Open account credit refers to credit carried up to 30 days.

Source: Fred R. Taylor and Maury E. Bredahl, Merchant-Dealer Credit in North Dakota, Part II: Merchant-Dealer Problems and Practices, Department of Agricultural Economics, North Dakota State University, April, 1969, p. 18.

Sales Financing by Fertilizer Dealers

This study deals with the trade credit management practices of fertilizer dealers in Oklahoma. Before defining the problem and stating the objectives of this study, the conditions existing in the industry which induce dealers to finance their customers' purchases should be reviewed. These conditions include (1) excess plant capacity, (2) excess inventories, (3) a seasonal demand for fertilizer, and (4) competition among dealers for sales.[44]

The usage of fertilizer in the United States has increased every year since 1960. The growth rates during the early 1960's exceeded the rates in the previous ten years. Fertilizer manufacturers, basing their future expectations for fertilizer usage upon the recent past, expanded production facilities. Also, growth expectations induced new companies to enter the industry. From 1963 to 1968, $4.3 billion was invested in U.S. and Canadian fertilizer production.[45] The expansion of marketing facilities by manufacturing firms, the increased numbers of retail outlets, and the addition of bulk and liquid blending facilities also increased the industry's investment. In 1969, a slowdown in the rate of growth in industry sales occurred. As a result of the combination of increased productive capacity and a lower rate of growth in sales than expected, inventories increased and the price of fertilizer was bid down. The price index for fertilizer decreased 6.6 percent during the 1960-1970 period.[46]

Faced with economic pressure to reduce their fixed costs per unit, the manufacturing firms increased the time in which dealers were allowed to pay for fertilizer. Fertilizer dealers facing competition from other dealers offered more lenient terms to farmers who needed additional

seasonal crop financing. The decisions to increase the length of payment due dates and to reduce service charges on overdue accounts were the result of pressure to expand or maintain sales as other dealers offered more lenient credit terms. Most dealers did not calculate the cost of expanding the use of financing.[47]

A study in 1967 suggested that the cost to the fertilizer industry for financing sales interest free was $160 million. This cost was calculated using the average length of repayment at the retail level assuming a six percent interest rate. The cost did not include collection costs or bad debt losses.[48]

Industry leaders have expressed much concern over the cost of supplier and dealer financing.[49, 50, 51] However, fertilizer dealers and suppliers have not recognized the cost of alternative financing arrangements and the importance of credit management.

Statement of the Problem

It is evident that dealers finance a significant proportion of their sales. If the expected returns from financing are greater than the expected credit costs, the dealer will gain from financing his customers' purchases. However, many input dealers do not know how much financing increases their sales quantity nor if the returns generated by increased sales are greater than the credit costs.[52] In addition, most dealers do not know how much impact the alternative credit arrangements have upon credit costs. Because of lack of knowledge concerning the alternative credit arrangements and the effect of these alternatives on costs, some dealers may be financing sales with arrangements which result in lower net returns than alternative arrangements.

The costs of dealer financing result from the additional capital investment, risk, and administrative functions required when the buyer's credit is accepted for merchandise or services.[53] The additional capital investment is that part of the dealer's working capital which is tied up in receivables. If the dealer must borrow funds to carry on other aspects of the business, he incurs a cash cost in the form of interest. At the very least, he incurs an opportunity cost on funds invested in receivables. The cost of the additional risk results from the possibility of not being paid by credit customers. Additional administrative costs are incurred when the manager and other employees use their time in extension, bookkeeping and collection efforts.

All of the credit costs are important to the dealer, but the major cost associated with dealer financing is the interest or opportunity cost on the investment of funds in receivables. A 1958 study of the credit costs for farm supply cooperatives indicated that the interest cost on the investment in accounts receivable amounted to 45 percent of the total credit costs. The study used a six percent cost of capital rate.[54] The magnitude of the dealer's investment in receivables depends on the level of sales in a given period of time, the proportion of those sales financed, and the length of time the financed sales remain unpaid. Each of these factors will be influenced by the type of credit instrument and the specific credit terms offered by the dealer. Several studies have investigated the impact of selected credit policy variables (discounts, payment due dates, and service charges) upon the proportion of sales financed and the timing of customer payments. However, additional information is needed concerning the impact of the credit

decision variables, considered simultaneously, upon the magnitude of the dealer's investment in receivables and his credit costs.

Objectives of the Study

The major objective of this study is to provide input supply firms, particularly fertilizer dealers, with information to help them in making decisions concerning the cost and use of alternative financing arrangements. The specific objectives of the study are:

1. To specify and describe the alternative credit arrangements presently being offered by Oklahoma fertilizer dealers, and to determine the firm characteristics which are associated with their use;
2. To analyze the impact of selected variables of the credit arrangement upon the proportion of customer purchases financed and upon the timing of payments for credit sales; and
3. Utilizing information developed in objectives 1 and 2, estimate the interest or opportunity cost of investing a dealer's funds in receivables for alternative financing arrangements.

Procedure Used and Organization of Thesis

Chapter II of the thesis defines the credit concepts used in the analysis and presents the economic theory applicable to the subject of dealer financing. The economic theory is used to explain the expected relationship between the credit decision variables and the cost of the

investment in receivables. The hypotheses to be tested in later chapters are developed and explained.

In order to obtain the data, a questionnaire was mailed during March, 1971, to all Oklahoma firms who sell bulk or liquid fertilizer to farmers. A copy of the questionnaire is included in Appendix A. In general, the fertilizer dealers were asked questions concerning the physical and sales characteristics of the firms, the types of financing arrangements they offered and the timing of customer payments for sales. Chapter III describes the dealers' physical characteristics and their credit arrangements and performance. Alternative credit instruments and credit policy decision variables are related to the dealers' physical and sales characteristics. The credit arrangements and firm characteristics are also related to credit performance.

Chapter IV reports the statistical analysis of the impact of the alternative credit instruments and credit policy decision variables upon the proportion of fertilizer sales made for cash and on credit terms and upon the timing of payments for credit sales. In Chapter V, the estimated empirical relationships between the credit policy decision variables and credit performance measures are utilized to estimate the cost of investing a dealer's operating funds in accounts and notes receivable. Finally, Chapter VI presents the conclusions of the study and the implications for additional research effort.

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CHAPTER II

THEORY AND CONCEPTS OF RECEIVABLES MANAGEMENT

When a dealer finances a customer's purchase, he foregoes the use of that sale's revenue until the customer pays. His working capital is tied up in a current asset, namely receivables. The funds are invested in receivables for the interval of time elapsing between the customer's purchase and payment dates. Each credit sale adds to and each payment subtracts from the dealer's investment in receivables. As with any investment project, specified costs and returns are associated with the dealer's financing activity.

A dealer has some managerial control over the magnitude of investment in receivables. The set of credit terms he offers will affect both the buyers' purchase and payment behavior. This purchase and payment behavior has a direct impact upon the amount of the dealer's investment in receivables. To determine the optimal credit terms to offer customers, the dealer must know what impact alternative terms have on the customers' behavior and how their purchase and payment decisions affect his returns and costs.

Alternative Credit Instruments and Decision Variables

Credit Instruments

There are several alternative credit instruments which provide

tangible evidence of the buyer's promise to pay the dealer.[1] The evidence of a credit transaction used most by input dealers is the open book account. An open account credit sale adds to the dealer's investment in accounts receivable. A record of the value of inputs sold on credit to each buyer is kept by the dealer. Since the credit transaction is evidenced by sales invoices, delivery recepits or shipping tickets, the extent of the buyer's debt obligation may be difficult to prove in a court of law.[2]

A second credit instrument frequently used to finance a customer's purchase of inputs is the promissory note. A promissory note is the buyer's written promise to pay the dealer a definite sum of money at a specified future time.[3] A sale transacted with a promissory note generates an investment in notes receivable. If negotiable, the note can be discounted by the dealer at a commercial bank. To be negotiable, the note must contain an unconditional promise to pay a definite sum of money on a determinable date to the order of a specified party. Also, the note must be written and signed by the maker (the buyer).[4] The promissory note may be secured or unsecured. With the secured note, the purchased input or some other asset owned by the buyer is pledged as collateral. Inputs such as fertilizer, which are expended in the production process before a payment is made by the farmer, are usually purchased with an unsecured promissory note. Other capital inputs such as machinery or equipment may have the specific input pledged as collateral in the secured note.

The conditional sales contract is another formal credit instrument used to finance the purchase of durable, capital inputs. In this case the seller retains the title to the input until the buyer pays. This

type of arrangement is rarely used to finance annual operating inputs such as feed, seed, or fertilizer.

Credit Policy Decision Variables

The dealer's credit arrangement includes not only the type of credit instrument but also a number of controllable decision variables. These variables, through their effect on the customers' purchase and payment behavior, influence the level of investment in account and note receivables.[5, 6] The credit policy decision variables which affect both accounts and notes receivable are defined as:

Cash Discount Rate - The percentage reduction in the quoted price of the input granted to the buyer if he pays within a specified number of days after the purchase date.

Cash Discount Period - The number of days between the purchase date and the date in which the customer must pay in order to receive a cash discount.

Level of Collection Effort - Efforts and expenditures incurred by the dealer to collect receivables.

Size of the Credit Line - The upper limit on the dollar amount one customer can purchase on credit terms.

Credit Standards - The minimum level of credit risk acceptable or some other criterion used to judge whether or not to sell to a customer on credit terms.

Other variables which affect specifically the level of investment in accounts receivable are defined below:

Account Due Period - The number of days between the purchase date and the date when full payment of the account is due.

Finance Charge Rate - The penalty, expressed as a percentage of the input price per unit of time, the customer must pay if the account is not paid by a specified date.

Finance Charge Period - The number of days between the purchase date and the date the finance charge is imposed.

Additional variables which apply to sales financed with a promissory note are defined as:

Note Issue Period - The number of days between the purchase date and the date the note is issued.

Interest Rate - The annual percentage rate charged on notes from the time notes are issued until the end of the note payment period.

Note Payment Period - The number of days between the date notes are issued and the date notes are due.

Farm Firm Purchase and Payment Behavior

This study is concerned with the dealer's management of accounts and notes receivable. A discussion of the impact of the credit policy decision variables upon the customers' purchase and payment behavior will prelude the theoretical analysis of the costs and returns associated with the dealer's financing activity.

Role of Economic Theory

The principles of resource employment help to determine how much fertilizer a farmer is willing to purchase when alternative credit arrangements are offered to him. The farm firm's input purchase behavior depends upon the marginal value product for using additional units of an input and the purchase price of the input. Assuming

operation of the law of diminishing returns and a constant price for the firm's output, each successive unit of an input employed in the production process adds less to the firm's total receipts. Thus, the marginal value product for the input declines as additional units of the input are employed. Each additional unit purchased by the firm adds a constant amount equal to the price per unit of the input to his total costs. Assuming the farmer's objective is to maximize profits, he should purchase additional units of the input until the marginal value product of the input is equal to the price per unit of the resource.[7]

If the purchase price declines, one would expect the farm firm to purchase a larger quantity of the input per unit of time. With a higher price per unit, he would purchase a smaller amount of the input. Given alternative dealers from whom to purchase the same input, the farmer would purchase from the dealer who offers him the lowest price.

When the dealer offers financing to the farmer, the relevant purchase price is the price of the input plus the marginal finance cost per unit of the input purchased.[8] Technically, the cost of financing includes not only the interest paid to a lender, but also the intangible cost due to a loss of liquidity (i.e., decreased credit reserve). The amount of an input to purchase should be determined by equating the marginal value product with the input price plus the marginal finance cost.[9]

Next consider the farmer's payment behavior. Once the farmer has decided to purchase from the dealer by exchanging his credit for inputs, when will he pay for the inputs? Since he has already purchased the input, the input price is not considered when making the decision as to when to pay for purchases. The length of time the input purchase

remains unpaid depends upon the cost of financing from the dealer relative to the cost of capital available to the farmer from other sources.[10] Assuming the farmer wants to minimize his finance costs, he will repay the dealer when the cost per dollar of financing for an additional unit of time from the dealer becomes greater than his cost of capital rate from other sources.

The farmer's cost of capital rate depends on the cost of capital from all alternative sources. When the farmer pays the dealer for inputs, he obtains the funds from either his own cash reserves or from an institutional lender. If he uses his own cash reserves, he sacrifices the yield these funds could earn if they were invested elsewhere. This yield is his opportunity cost. If he borrows from an institutional lender, he incurs a cash cost in the form of interest paid to the lender.[11] Since the farm firm can obtain funds from either its own reserves or from lenders, both the opportunity cost and the interest rate should be considered when determining his cost of capital rate. The best estimate for the cost of capital rate is probably the weighted average cost of capital from all sources.[12] However, for the purposes of this analysis of the farmer's payment behavior, assume his cost of capital rate from all alternative sources is equal to a given rate of interest for borrowed capital. Thus, unless otherwise stated, the opportunity cost rate on his cash reserves is equal to the rate of interest on borrowed capital.

Credit Policies and the Finance Cost

The cost of the financing a farmer obtains from an input dealer depends upon the type of credit arrangement used to finance the sales

transaction. When sales are financed with an open book account, the cost depends primarily upon four of the credit policy decision variables -- the account due period, the cash discount rate, the cash discount period, and the finance charge rate.[13, 14] When a note is used as the credit instrument, the price the farmer pays for financing depends upon the cash discount rate, the cash discount period, the time notes are issued, the annual interest rate charged and the note payment period.

The marginal finance cost is the difference between the price per unit of the input on the date of payment and the price per unit on the purchase date. The marginal finance cost can be determined as follows:

$$m = p \cdot f \qquad (2\text{-}1)$$

where:

m = the marginal finance cost per unit of the input purchased,

f = the finance cost per dollar, and

p = the input price if paid for on the purchase date.

In order to compare the finance cost associated with alternative credit arrangements, the marginal finance cost is translated into an equivalent annual interest rate. The formula for converting the marginal finance cost to an annual interest rate is:

$$i = \frac{m}{p \cdot t} = \frac{p \cdot f}{p \cdot t} = \frac{f}{t} \qquad (2\text{-}2)$$

where:

i = the annual interest rate, and

t = the proportion of a year financed = $\frac{\text{number of days}}{360}$

The equivalent annual interest rate is the ratio of the finance cost per dollar to the proportion of the year financed. Using the finance cost expressed as an annual interest rate, the effect of selected credit instruments and credit policy variables upon a farmer's purchase and payment behavior can be shown.

Account Policy--Account Due Period. Assume the account due period is 30 days from the purchase date and that no cash discount is offered for early payments nor a finance charge imposed for late payments. Thus the price the farmer pays for inputs is the same on the purchase date as on the payment date. The marginal finance cost is zero assuming the dealer does not have an interest charge hidden in the price of the inputs.[15] Unless the farmer has idle cash which can not earn a positive rate of return elsewhere, he will take advantage of the free financing. The farmer does not pay a direct interest cost for using the dealer's funds longer than thirty days. However, after the 30-day period, the dealer may mail due notices or take other action to encourage the farmer to pay his overdue account. Failure to pay near the end of the account due period may raise questions about the farmer's ability to pay and may cause both supply firms and other lenders to be less willing to finance his purchases in the future.[16] Thus, the existence of an account due period may create a psychological barrier which encourages the farmer to pay within that period.

Now assume the dealer offers a 60-day rather than a 30-day account due period. If the price of the input remains constant, the farmer will take advantage of the dealer's willingness to provide free financing for an additional 30 days. If he pays during the first 30 days, the farmer would forego the opportunity returns from using his money an

additional 30 days. Or, if he has to borrow to pay, he would incur a cash cost in the form of interest paid to another lender for 30 days. Hence, the farmer would want at least 60 days to pay because his cost of capital from other sources is greater than the finance cost from the dealer.

Account Policy--Cash Discounts. Some dealers may not rely upon the account due period alone to provide the incentive for a farmer to pay the account when due. A cash discount is often offered to encourage an early payment for inputs. The cash discount rate is the percentage reduction in the quoted input price the farmer will receive if he pays within the cash discount period. The price of the input on the purchase date is the quoted price less the amount of the cash discount. If the farmer does not pay within the cash discount period, the cash discount is foregone and the amount of this discount measures the finance cost per dollar. Assume the dealer offers a one percent cash discount rate and a 10-day discount period. If the farmer does not pay during the discount period, he pays one cent more than the 99 cents he could have paid for each dollar's worth of inputs purchased during the discount period. Thus, the finance cost per dollar (f) for any payment after 10 days is .0101 (.01/.99) with the one percent cash discount. A 1.01 percent finance cost does not seem high until it is translated into an equivalent annual interest rate. If he pays for the inputs at anytime within the 10-day period, the equivalent annual interest rate is zero. But, if the farmer pays on the 20th day after the purchase date, he receives only 10 days (20-10) of financing and the equivalent annual interest rate is 36.46 percent ($i = f/t = .0101/.0277$). If the farmer waits 30 days to pay, he is foregoing 1.01 cents per dollar for 20

(30-10) days of financing. Thus, the annual interest rate is 18.2 percent ($i = f/t = .0101/.0555$). The finance cost per dollar per year is higher when a buyer pays on the 20th day rather than on the 30th day. Since the absolute size of the cash discount foregone does not change, payments further from the end of the cash discount period result in a lower equivalent annual interest rate.

The equivalent annual interest rate for a one-percent, 10-day, cash discount is shown graphically in Figure 1. Curve AEC shows the equivalent annual interest rate the buyer sacrifices for alternative payment periods when he does not pay during the 10-day cash discount period. The annual interest rate is measured on the vertical axis. The number of days elapsing between the purchase date and the payment date is shown on the horizontal axis. Assume the farmer's cost of capital rate from sources other than the input dealer is eight percent per year (line DEF). If he pays within the 10-day period (OB), he will need to pay the dealer with funds from other sources which cost eight percent per year. The farmer would prefer to borrow from other sources at eight percent and pay within the cash discount period rather than to pay the dealer on the 30th day. The cost of financing from the dealer for a 30-day payment is 18 percent per annum. Only, if he obtains financing from the dealer for more than 55 days, would the equivalent annual interest rate be less than his cost of capital rate (number of days where lines AEC and DEF intersect). If the dealer does not offer an additional incentive to pay, a farmer who forfeits the cash discount would likely wait for more than 55 days to pay in order to minimize his finance cost.

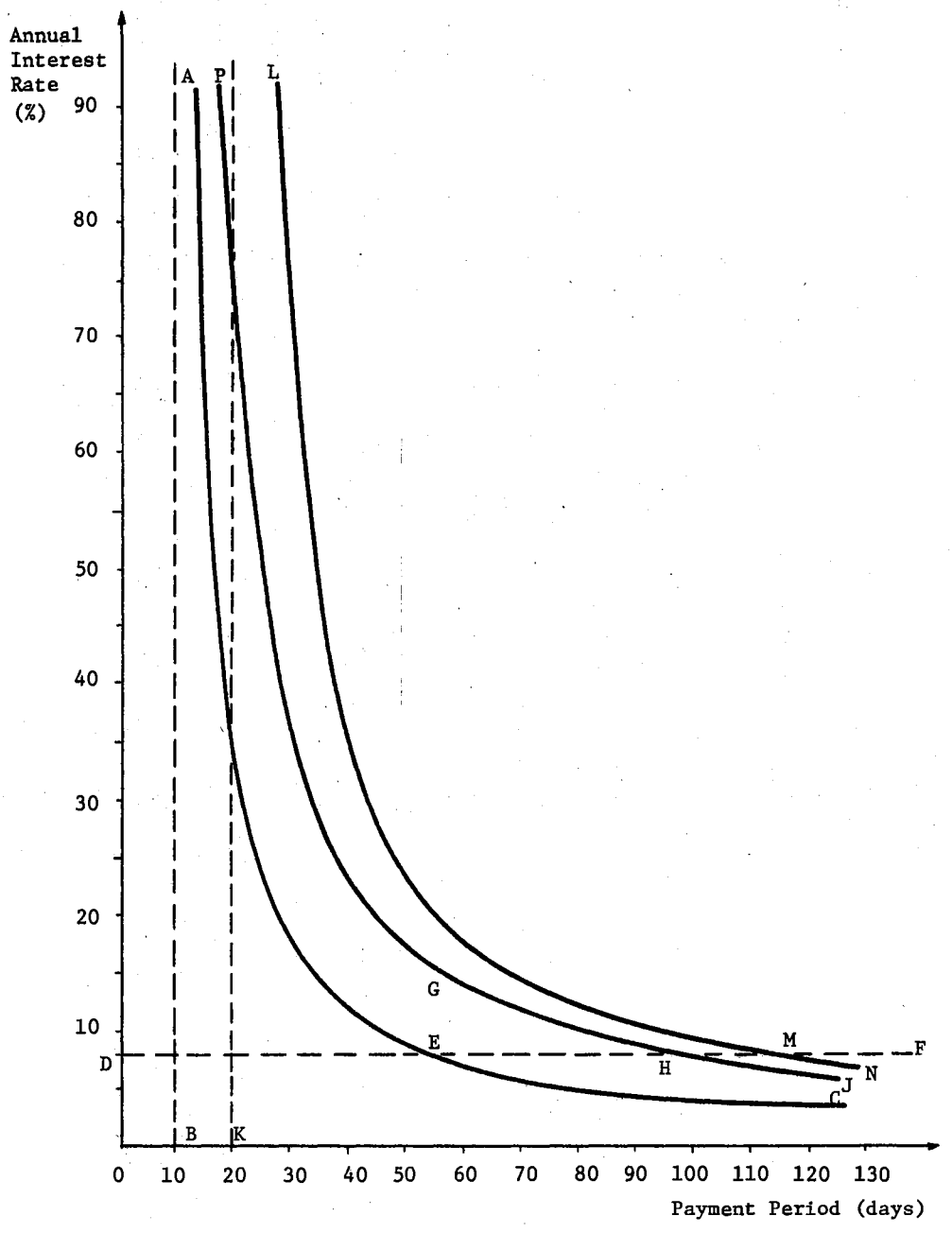


Figure 1. Equivalent Annual Interest Rates for Cash Discount Arrangements

Additional incentive for early payment could be provided by raising the cash discount rate to two percent. Assuming the same 10-day cash discount period, the new equivalent annual interest rates for payments after 10 days are shown by the curve PGHJ. The finance cost or the cash discount rate foregone by not paying within the 10-day period is 2.04 (.02/.98) cents per dollar (2.04 percent of the input price). The equivalent annual interest rate sacrificed by the farmer who pays in 55 days is 16.32 (f/t = .0204/.125) percent (point G) which is more than twice the eight percent rate for a one percent cash discount (point E). The higher cash discount rate provides additional incentive to pay within the cash discount period. However, if a buyer foregoes the cash discount, he would have to obtain financing from the dealer for approximately 102 days (point H) in order to have an annual interest rate less than his opportunity cost of capital rate (eight percent). Unless some additional incentive to pay is provided, some farmers may be induced to pay later, due to the higher cash discount rate.

A lengthening of the cash discount period from 10 days to 20 days assuming a two percent cash discount rate would result in the equivalent annual interest rates for payments after 20 days shown by curve LMN. The entire curve is shifted to the right. A farmer formerly paying late may now pay within the longer cash discount period. However, with the longer cash discount period, the farmer who foregoes the cash discount may be encouraged to wait even later than before to pay. The interest rate curve intersects the cost of capital rate line at 112 (point M) days rather than 102.

As shown in Figure 1, the equivalent annual interest rate for a payment made after the discount period but within 30 days is well above

the farmer's cost of capital rate of eight percent for any of the credit arrangements offering a cash discount. Considering the alternative of paying within the cash discount period compared to paying at 30 days, the farmer could minimize his finance cost by paying within the discount period and using available capital or borrowing from other lenders at a cost of eight percent. However, if the farmer does not pay within the cash discount period, he may be tempted to delay payment well beyond the end of the 30-day account due period. Rather than relying upon his collection efforts to encourage the farmers to pay at the end of the account due period, the dealer may impose a stronger economic incentive by charging a penalty for late payments.

Account Policy--Finance Charge. Suppose the dealer offers no cash discount but adds one percent to the input price on the purchase date for every 30 days beyond the 30-day account due period the account is unpaid. Hence, the farmer pays one cent for the use of a dollar for every 30 days.[17] The annual interest rate is 12 percent ($f/t = \frac{.01}{30/360}$). If the farmer obtains financing from the dealer, the annual interest rates for the alternative payment dates are shown as OBPRS in Figure 2. Assuming the farmer's cost of capital rate from other sources is eight percent per year (line DF), he would pay the dealer on the 30th day. Additional financing from the dealer would cost more than the opportunity cost of using his available funds or the cost to borrow from other lenders.

Now suppose the dealer also wants to provide some incentive for the farmer to pay within 10 days. If he offers a cash discount of one percent for a payment in 10 days, the equivalent annual interest rate for payments from the purchase date to 10 days is zero (Figure 3,

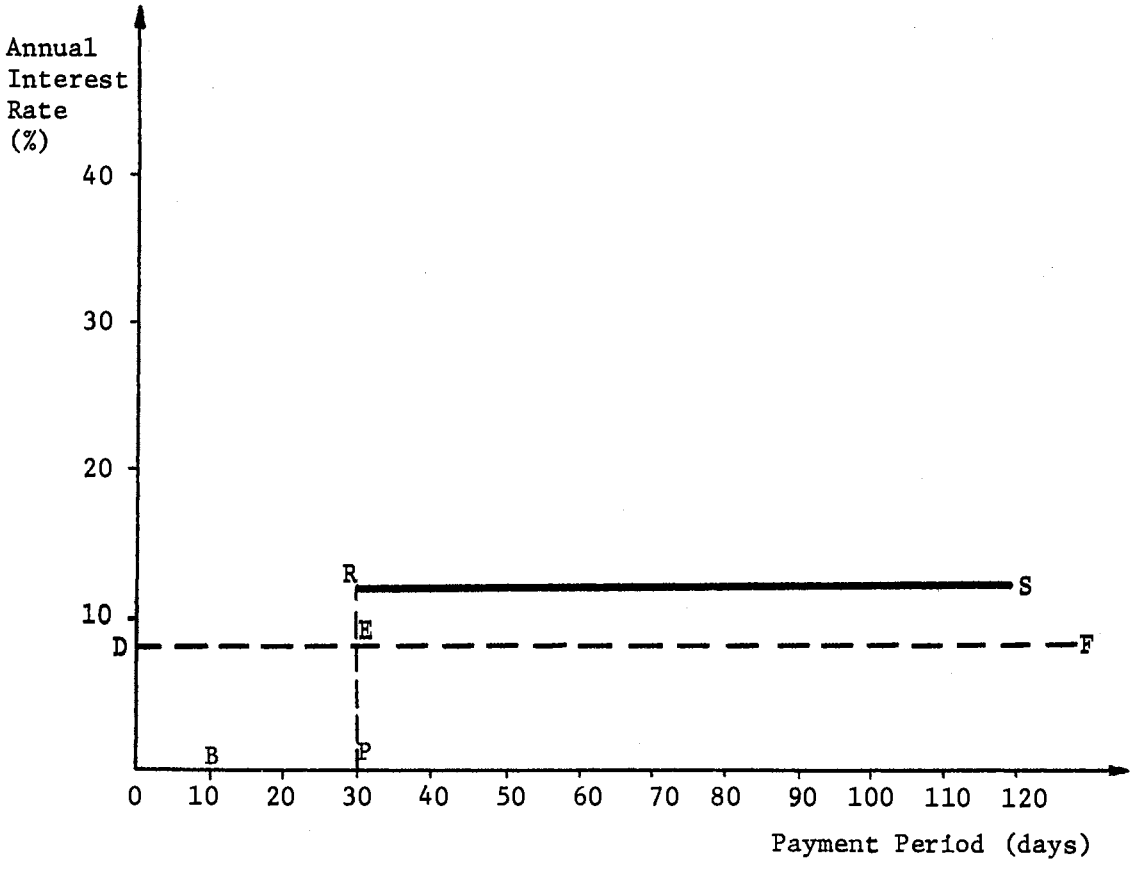


Figure 2. Equivalent Annual Interest Rates for Finance Charge Arrangements

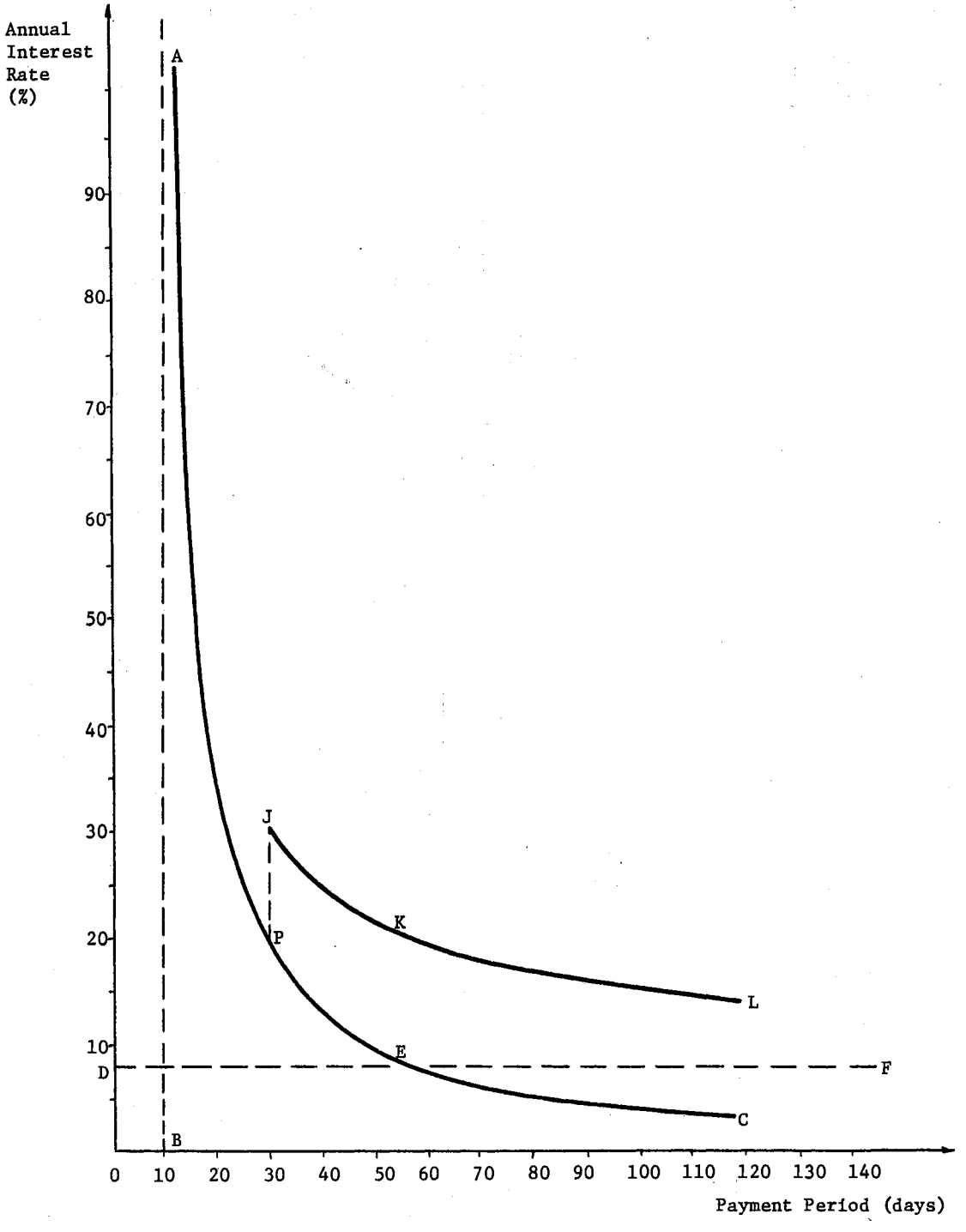


Figure 3. Equivalent Annual Interest Rates for Cash Discount Finance Charge Arrangements

Segment OB). A payment on the 11th day has an equivalent annual interest rate of approximately 360 percent. The rate decreases along the curve AP to 18.2 percent on the 30th day. After the 30th day the dealer charges a one percent per month finance charge rate. Thus, for payments after the 30th day the annual interest rate is 12.1 percent ($f/t = \frac{.0101}{30/360})^{18}$ plus the equivalent annual interest rate associated with foregoing the one percent cash discount ($f/t = .0101/t$, t = proportion of the year financed). The total equivalent annual interest rate for financing from the dealer after 30 days is shown in Figure 3 by curve JKL. The curve, JKL, can be obtained by adding 12.1 percent to curve PC.

Assuming the farmer's cost of capital rate from alternative sources is eight percent (line DEF), he would minimize his finance cost by paying for inputs ten days after the purchase date. He would not pay before 10 days because the financing from the dealer is free during this period. For all payment dates after the 10th day, the cost of capital rate from other sources (eight percent) is less than the equivalent annual interest rate he would pay to the dealer. If he does not pay on or before the 10th day, the equivalent annual interest rate declines for later payment dates but remains greater than the 12.1 percent finance charge rate.

Note Policy. The second type of credit instrument used by dealers to finance their customer's purchases is the promissory note. The cost to the farmer is specified on the note as an annual interest rate. Also, the length of time from the date the note is issued until repayment by the farmer is usually specified. The note may be issued on the purchase date or after the sale has been carried as an open account for some specified time. If the buyer knows that he will have to give the dealer an interest bearing note for the amount of his purchases unpaid at the

end of the account due period, the note may serve to induce the farmer to pay his account. The interest rate on a note serves the same purpose as a finance charge on an open account. However, the farmer may be more likely to pay the interest due the dealer if he has signed a promissory note.

The farmer's payment decision is less complex when his purchases are financed with a note rather than an open account. If notes are issued on the purchase date, the farmer will allow the dealer to finance his purchases only if his annual cost of capital rate from other sources is greater than the annual interest rate specified on the note. Otherwise, he will pay on the purchase date. If a farmer utilizes the dealer's financing, he will not pay until the end of the note payment period. It is assumed that the dealer will not refinance the note after the note payment period.

The dealer may also offer the farmer a cash discount if he pays on the purchase date. Then the farmer will pay on the purchase date if his cost of capital rate is less than the annual interest rate specified on the note plus the equivalent annual interest rate resulting from sacrificing the cash discount. Assume a note is issued for six months (180 days) at a annual interest rate of nine percent and the cash discount rate for a payment on the purchase date is one percent. The total finance cost expressed as an annual interest rate for a payment at six months is 2.02 $(f/t = \frac{.0101}{180/360})^{19}$ percent provided by the cash discount plus 9.1 percent $(\frac{.09/.99}{1})$. Unless the farmer's cost of capital rate is greater than 11.12 percent, he minimizes his finance cost by paying the dealer cash and borrowing from other sources.

Dealer Management of Receivables

Input supply firm managers can control the level of the investment in receivables by manipulating the controllable credit decision variables. As previously shown, the credit variables affect the cost the farmer pays for financing. The farmer purchases his inputs and obtains financing in a manner which minimizes his costs. The purchase behavior of all customers determines the quantity of fertilizer the dealer sells for cash and on credit. Their payment behavior determines the length of time credit sales remain unpaid. Thus, the resulting farmer behavior will affect the dealer's costs and returns. If the dealer's objective is to maximize net returns, he should offer the credit arrangement (combination of decision variables) which yields the highest possible net returns.

Role of Economic Theory

The input dealer's market can be characterized as a differentiated oligopoly.[20] The number of sellers of a specific input, say fertilizer, in a local market area is small enough that one dealer's marketing activities (prices, and level of services offered) have an impact on the sales and profits of other firms. The fertilizer sold by one dealer is a close substitute for the fertilizer sold by another dealer. The products are not perfect substitutes, but are slightly differentiated. The differentiation may be attributable to differences in the physical composition of the product or to differences in the services offered by the dealer who sells the product.[21]

In this oligopolistic market, the effect of a change in a credit decision variable upon the customer's behavior will depend upon the

competitors' reactions. The dealer incurs the risk that an action taken to increase his profits may result through competition in decreased, increased, or the same profits. However, in the following theoretical and empirical analysis, the competitors' credit policy and other marketing activities are assumed to be fixed unless stated otherwise.

The basic economic principles of marginal cost and marginal revenue developed in the economic theory of the firm apply to questions concerning the management of receivables.[22] The dealer's operating capital is a scarce resource that has several alternative uses. A change in a dealer's credit policy may require that additional operating capital be invested in receivables. Additional funds should be invested in receivables only if the use of funds adds more to the dealer's revenue (sales and financial revenue) than to his costs. A change in the dealer's credit policy that frees funds should be undertaken only if the reduction in revenue is less than the decrease in costs. These costs include the cost of obtaining the funds invested in receivables (interest or opportunity) and any other firm costs affected by the change in the credit policy.

Costs and Returns of Dealer Financing

Before the dealer can determine the optimal receivables investment, he must identify the possible revenues and costs which result from his financing activities. The major purpose of this study is to investigate the effect of the credit policy decision variables upon the level of receivables and the resulting investment cost. However, to provide a conceptual framework for the analysis, all credit returns and costs

and their relationships to credit decision variables are defined.

The system of equations shown below define the short-run costs and returns for a dealer's financing activity. The equations are formulated assuming a static and deterministic environment. An analysis of each argument in the equations will illustrate how specified credit decision variables affect the dealer's costs and returns.

$$\Pi = z - w \tag{2-3}$$

(profit per year) (revenue) (cost)

$$z = y + x + F \times \left(\frac{\sum_{j=1}^{N} P_j (\lambda_j - T)}{365} \right) \tag{2-4}$$

(revenue) (cash sales) (credit sales) (financial revenue)

$$w = v(x+y) + B + R(y+xd) \tag{2-5}$$

(costs) (production and marketing costs) (credit administrative costs) (cash discounts)

$$+ Ex(1-d) + Cx \left(\sum_{j=N-2}^{N} P_j + b \right) + bx + \Phi x \left(\frac{\sum_{j=1}^{N} P_j \lambda_j + b\theta}{365} \right)$$

(collection costs) (bad debt losses) (investment costs)

where: $\sum_{j=1}^{N} P_j + b = 1$, and

$(\lambda_j - T) > 0.$

The credit decision variables:

F = Finance charge rate per year expressed as a decimal.

T = Start of the finance charge period expressed in days from the purchase date.

B = Fixed administrative credit costs paid for extension and bookkeeping.

R = Cash discount rate expressed as a decimal.

E = Collection expenditures per dollar of credit sales not paid for during the cash discount period.

C = Extra collection expenditures per dollar of credit sales not paid for before the start of the last three payment intervals.

The state variables:

Π = Net profit per year ($).

z = Total revenue per year ($).

w = Total cost per year ($).

y = Annual sales for cash on the purchase date ($).

x = Annual sales on credit ($).

P_j = Proportion of credit sales paid during the jth payment interval, j = 1, 2, ... N.

d = Proportion of credit sales paid during the cash discount period.

b = Proportion of credit sales not paid by the end of the Nth payment interval.

v = variable production and marketing costs per dollar of sales (excluding all credit costs)

The fixed parameters:

N = Number of payment intervals.

λ_j = Number of days between purchase date and the median day in the jth payment interval.

Φ = Constant cost of capital rate per year expressed as a decimal.

θ = Number of days from purchase date to the date an unpaid sale is written off the books as a bad debt loss.

The dealer receives revenue from three sources -- cash sales, credit sales, and financial revenue (2-4). It is assumed that the input price and all marketing variables other than credit arrangements

are held constant. Thus, the rate of dollar cash and credit sales per year (x+y) is dependent upon the dealer's credit decision variables. The level of financial revenue received depends on the finance charge rate (F), the volume of credit sales (x) and the proportion of credit sales (P_j) paid during each payment interval after the start of the finance charge period (T). The average number of days each dollar of credit sales remains outstanding after T days is estimated by multiplying the proportion of credit sales (P_j) paid in the jth payment interval by the number of days beyond T days a sale is outstanding ($\lambda_j - T$)[23] and then summing this quantity over all j payment intervals. To determine the finance charge revenue, the average proportion of a year a dollar is outstanding beyond the start of the finance charge period is multiplied by Fx (the finance charge rate per year times the volume of credit sales).

Next consider the dealer's total costs (2-5). The total variable production and marketing costs (excluding credit costs) depend on the volume of sales per year (x+y) and the variable cost rate per dollar of sales (v). Whether the variable production and marketing cost per dollar of sales (v) increases, decreases or remains constant due to a change in the dealer's credit policy depends upon the changes in the level of technical efficiency in the use of the production and marketing inputs.[24] The credit costs include administrative costs, value of cash discounts paid, collection costs, bad debt losses, and investment costs.

The credit administrative costs (B) are incurred when the manager and other employees use their time and effort to explain the credit policy to customers and to keep records of the purchase and payment

transactions. This cost is not likely to depend upon the volume of credit sales, but on the number of new credit customers and the number of credit purchases and payments made per year. It is assumed that this cost is incurred at a fixed rate per year (B) if any sales are made on credit.

Assuming that the dealer's sales (x+y) are valued at a fixed quoted price, a discount granted to customers who pay within the cash discount period is a reduction in revenue or an additional cost. The value of cash discounts given is a function of the volume of cash sales (y), the volume of credit sales paid for within the cash discount period (xd) and the specified cash discount rate (R).

When a dealer sells on credit, he also incurs a cost to prepare and mail out due notices to all customers who do not pay during the discount period. The size of this cost depends on the number of credit customers. However, for the purposes of this theoretical analysis, assume the dealer spends a specified amount (E) per dollar of credit sales paid for after the discount period. In addition, for each dollar of sales remaining unpaid after a specified date, the dealer pays an additional cost (C). This extra collection cost is necessary to cover the expenses to mail additional due notices. Also, for some accounts, the dealer may have to hire a collection agency or a lawyer in a final attempt to collect a delinquent account. In equation (2-5), the extra collection expenditures are incurred on all sales paid for during the last three payment intervals $[x(P_{N-2} + P_{N-1} + P_N)]$ and on those sales not paid which are eventually written off as bad debts (bx).

A dealer who sells on credit incurs the risk of not recovering part of his investment in receivables. If credit sales are unpaid

after the Nth payment interval or after θ days, they are considered a bad debt loss. The number of days before writing off a bad debt (θ) is set by the individual dealer. After θ days the value of the sale not paid for is taken out of receivables and entered on the dealer's records as a cost. The cost is shown as bx in equation (2-5).

The dealer's receivable investment cost is estimated by multiplying the firm's annual cost of capital rate (Φ) times the average annual investment in receivables. The dealer's cost of capital rate is at least the opportunity yield he could earn if he invested the funds tied up in receivables in other alternatives. If he has limited cash reserves and must borrow to compensate for the funds being tied up in receivables, his cost of capital rate is the interest rate charged to borrow these funds. For the purpose of this theoretical and empirical analysis, it is assumed that the dealer's cost of capital rate (Φ) is fixed at the interest rate he pays to borrow funds from leaders.

The average annual investment in receivables depends on the volume of credit sales per year (x) and the average proportion of a year a dollar of credit sales is invested in receivables $\left(\sum_{j=1}^{N} P_j \lambda_j + b\theta \right)/365$. The $\sum_{j=1}^{N} P_j \lambda_j$ term is an approximation of the average collection period on credit sales which are paid for during the N payment intervals or during θ days. The average collection period is the average number of days from the purchase date to the date of payment for a dollar of credit sales. It is a measure of the buyers' timing of payments for inputs purchased on credit. The distribution of payments according to their age at the time of collection can be used to compute an estimate of the average collection period.[25] The approximate age at the time of collection (λ_j days) for sales paid in each jth interval (j = 1, 2, ...N) is

multiplied by the proportion of credit sales (P_j) paid for in each payment interval. The product is then summed over the N payment intervals. The sales written off as bad debts (bx) are invested in receivables for θ days. Thus, the average number of days a dollar of credit sales is invested in receivables is $\left(\sum_{j=1}^{N} P_j \lambda_j + b\theta\right)$. The proportion of credit sales paid for $\left(\sum_{j=1}^{N} P_j\right)$ plus the proportion of sales not paid in θ days (b) is equal to one. By dividing by 365 days and multiplying by the volume of credit sales per year (x) the average annual investment in receivables is determined.

Account and Note Receivables Investment Cost

The dealer's investment in receivables may be in either accounts receivable, notes receivable, or a combination of the two. The cost of the investment for the different credit instruments is not likely to be the same. For a given dealer the volume of sales sold with an open account transaction is usually different than the volume of sales in a note transaction. Also, the timing of payments will be different for the two instruments. To compare the dealer's investment cost for alternative credit instruments and alternative credit decision variables, the receivables investment cost per dollar of total sales will be estimated for each alternative arrangement.

The volume of credit sales per year (x) is the sum of credit sales on account and on notes (2-6).

$$x = a + n \tag{2-6}$$

where:

x = credit sales per year ($),

a = account sales per year ($), and

n = note sales per year ($).

Total sales is the sum of account sales (a), note sales (n), and cash sales (y). Then, as shown in equations (2-7), (2-8) and (2-9) the proportion of total sales on notes, on accounts and for cash, respectively are:

$$x_a = a/(x + y) \tag{2-7}$$

$$x_n = n/(x + y) \tag{2-8}$$

$$y_c = y/(x + y) \tag{2-9}$$

where:

y = cash sales per year ($),

x_a = proportion of total sales on account,

x_n = proportion of total sales on notes,

y_c = proportion of total sales for cash and

$x_a + x_n + y_c = 1$.

In addition to the proportion of sales on accounts and notes, the investment in accounts and notes receivables per dollar of total sales depends on the timing of customer payments for account and note sales. Cash sales are paid for on the date of purchase. The estimated average collection period for accounts is the average number of days a dollar sold on account is invested in receivables (2-10).[26]

$$M_a = \sum_{j=1}^{N} P_j \lambda_j + b\theta \tag{2-10}$$

where:

M_a = average collection period on account sales (days),

P_j = proportion of account sales paid in the jth payment interval,

b = proportion of account sales not paid during N payment intervals,

θ = number of days before an account sale is written off as a bad debt, and

λ_j = number of days from purchase date to the median date in jth payment interval (days).

Assuming that the farmer pays for purchases made with a promissory note at the end of the note payment period, the average number of days a dollar sold on a note is invested in receivables is equal to the note payment period specified on the note (2-11).

$$M_n = K \tag{2-11}$$

where:

M_n = average collection period on note sales (days), and

K = note payment period (days).

Thus, the receivables investment cost per dollar of total sales can be determined as shown in equation (2-12).

$$I = \Phi\left(\frac{x_a M_a}{365} + \frac{x_n M_n}{365}\right) \tag{2-12}$$

where:

I = investment cost per dollar of total sales,

Φ = dealer's annual cost of capital rate,

$x_a M_a/365$ = investment in accounts receivable per dollar of total sales, and

$x_n M_n/365$ = investment in note receivable per dollar of total sales.

One also could calculate the cost per dollar of credit sales by dividing equation (2-12) by the proportion of total sales which are credit sales $(x_a + x_n)$. To compare the investment costs for alternative credit arrangements, the proportion of total sales on account (x_a), the proportion of total sales on notes (x_n) and the average collection period on account sales (M_a) should be estimated for each combination of credit decision variables.

Summary of Relationships

The hypothesized relationship between specified account credit decision variables and the proportion of total sales on account can be specified in general as:

$$x_a = f(A, T, D, R, F) \qquad (2\text{-}13)$$

where:

x_a = proportion of total sales on account,

A = account due period,

T = finance charge period,

D = cash discount period,

R = cash discount rate, and

F = finance charge rate.

One would expect that a longer account due period (A) or finance charge period (T) offered by a dealer would increase the proportion of sales made on account (x_a). A higher discount rate (R) would increase the proportion of sales for cash relative to the proportion on account. A

longer cash discount period (D) would induce a farmer to pay after the purchase date, thus increasing the proportion of dealer sales on account. A higher finance charge rate (F) may reduce the proportion of sales on accounts. However, if the start of the finance charge period is imposed several months after the purchase date, a finance charge may not affect the farmer's purchase behavior.

The same credit decision variables also affect the average collection period on account sales (M_a). The relationship existing between the average collection period and the decision variables is hypothesized as follows:

$$M_a = g(A, T, D, R, F) \qquad (2\text{-}14)$$

where:

M_a = the average collection period on account sales.

A longer finance charge period (T) or account due period (A), without a change in any of the other variables, would likely increase the number of days the farmer will allow his account to remain unpaid. A finance charge rate (F) would enforce payment at the end of the account due period provided the finance charge rate is higher than the cost the farmer pays to obtain funds elsewhere. A higher cash discount rate (R) may provide additional incentive for the farmer to pay during the cash discount period. However, as noted in the theory of farmer payment behavior, the higher cash discount rate may encourage a farmer who foregoes the cash discount to pay after the account due period. The effect of the cash discount on payment behavior depends on the interrelationships existing between it and other variables -- the cash discount period and the finance charge rate. The length of the cash discount

period (D) may have offsetting effects on the average collection period. A longer cash discount period will likely increase the opportunity cost of foregoing the cash discount. Thus, more incentive is provided for the farmer to pay during the discount period. But, a longer cash discount period offers the farmer who was paying in the shorter period additional free financing. Also, if the farmer foregoes the cash discount, there may be no incentive to pay at the end of the account due period.

The expected relationship existing between the proportion of total sales on notes (x_n) and the note decision variables is specified in general as:

$$x_n = h(K, Q, R) \tag{2-15}$$

where:

K = the note payment period,

Q = the interest rate charge on notes, and

R = the cash discount rate.

If the annual interest rate (Q) charged on notes is less than the farmer's cost of capital rate, one would expect a longer note payment period (K) to increase the proportion of sales made with notes (x_n). An interest rate on notes (Q) higher than the farmer's cost of capital rate would encourage the farmer to pay for inputs on the purchase date rather than to use the dealer's financing. A higher cash discount rate (R) would also encourage the farmer to pay on the purchase date. However, longer note due periods (K) reduce the effectiveness of the given cash discount rate in encouraging the farmer to pay on the purchase date.

The average collection period (M_n) on notes is assumed to be equal to the note payment period (K). The note payment period is usually specified on the credit instrument. Thus, the functional relationship for this payment coefficient does not need to be estimated. However, the note payment period used will vary among dealers.

The expected functional relationships between credit policy variables and credit performance measures specified above are the hypotheses for this study of dealer financing. One can determine the expected investment cost for alternative credit policies by using equation (2-12) and estimating the empirical relationships for x_a, x_n, and M_a. A comparison of the investment costs per dollar of sales for alternative credit instruments and decision variables will aid the dealer in making his credit decisions. This information could be combined with data for the other credit costs to determine the dealers' total credit costs for alternative arrangements. Given the credit costs per dollar of total sales, the dealer can compare the level of sales he would need to achieve for each alternative credit arrangement in order to recover the credit costs.

FOOTNOTES

[1]Robert H. Cole, Consumer and Commercial Credit Management (3rd ed., Homewood, Illinois, 1968), p. 559.

[2]William Beranek, Analysis of Financial Decisions (Homewood, Illinois, 1963), p. 272.

[3]Cole, p. 600.

[4]Ibid.

[5]Harlan R. Patterson, "New Life in the Management of Corporate Receivables", Credit and Financial Management (February, 1970), p. 17.

[6]Beranek, p. 273.

[7]Richard H. Leftwich, The Price System and Resource Allocation (4th ed., Hinsdale, Illinois, 1960), pp. 285-287.

[8]Marginal finance cost per unit equals the finance cost per dollar times the input price per unit.

[9]C. B. Baker, "Credit in the Production Organization of the Firm", American Journal of Agricultural Economics, Vol. 50, No. 3 (August, 1968), p. 508.

[10]Robert J. Lindsay and Arnold W. Sametz, Financial Management, An Analytical Approach (rev. ed., Homewood, Illinois, 1967), p. 85.

[11]Ibid., p. 55.

[12]Patterson, p. 17.

[13]Lindsay and Sametz discuss the impact of three credit terms exclusive of the finance charge rate on the buyer's payment behavior.

[14]Lindsay, pp. 91-95.

[15]Ibid., p. 92.

[16]Ibid., pp. 94-95.

[17]There is a one percent per month finance charge rate. It is assumed that this rate is continuous with respect to time. That is, a farmer paying one day after the 30 day period pays 1/30 of one percent of the purchase price as a finance charge.

[18]The finance cost per dollar is one percent of the quoted input price but 1.01 percent of the input price on the purchase date (.01/.99).

[19]The finance cost per dollar resulting from foregoing the cash discount is one percent of the quoted input price or 1.01 (.01/.99) percent of the input price on the purchase date.

[20]Leftwich, p. 107.

[21]C. E. Ferguson, Microeconomic Theory (rev. ed., Homewood, Illinois, 1969), p. 287.

[22]Lindsay, p. 33.

[23]For a given finance charge period T, $(\lambda_j - T)$ is constant for any payment interval. Since λ_j is the median number of days in the payment interval, the average days is an approximation. Financial revenue is received on sales where $(\lambda_j - T)$ is positive.

[24]Leftwich, p. 184.

[25]Haskel Benishay, "Managerial Controls of Accounts Receivable: A Deterministic Model", Journal of Accounting Research (Spring, 1965), p. 124.

[26]Since the proportion of account sales written off as bad debts (b) are invested in receivables for θ days, these sales are included when calculating the average collection period.

CHAPTER III

A DESCRIPTION OF THE DATA

The Population and Sample

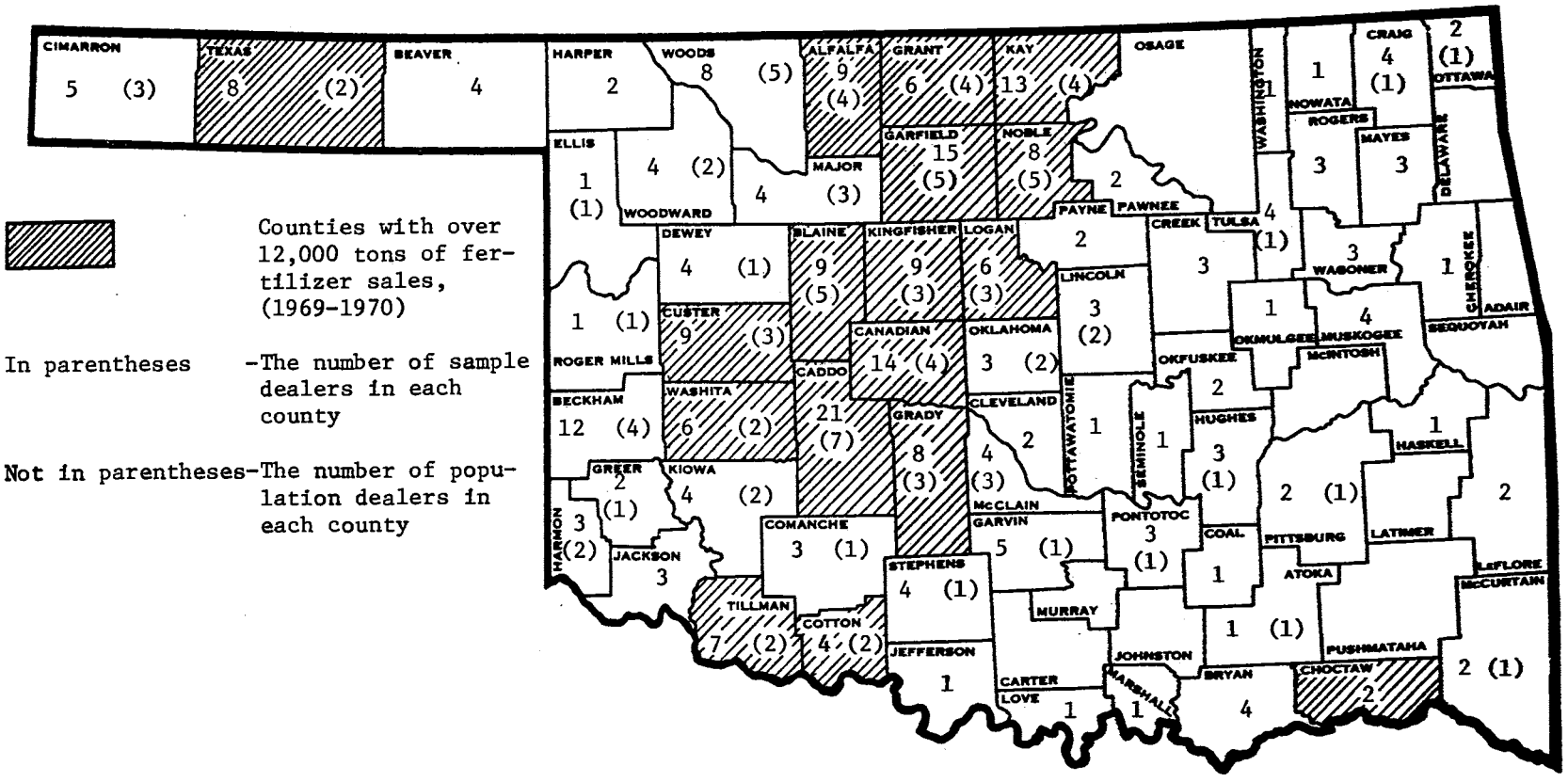
Population

A mail questionnaire was sent to each input dealer in Oklahoma who sells dry bulk or liquid mix fertilizer to farmers. The questionnaire was mailed to 295 dealers in March, 1971. A copy of the questionnaire is attached in Appendix A. With the exception of the manufacturer-owned retail outlets, dealers with branch offices were sent only one questionnaire. Each retail outlet owned by a fertilizer manufacturer was mailed a questionnaire.

Figure 4 shows the location of the 295 dealers according to Oklahoma counties (numbers not in parenthesis). The 295 dealers are located in 67 of the 77 counties. Figure 4 also shows that 17 counties had over 12,000 tons of total fertilizer sales for the 1969-1970 fertilizer year (including sales of dealers not surveyed).[1] One hundred fifty-four (52 percent) of the 295 dealers are located in these 17 counties. The other 141 dealers (48 percent) are located in 50 counties.

Sample Dealers

Usable questionnaires were returned by 101 (34 percent) of the 295 dealers. All firms did not answer each part of the questionnaire.



Source: Oklahoma State Board of Agriculture, Charts and Maps Showing Fertilizer Consumption in Oklahoma, 1969-1970.

Figure 4. The Distribution of the 295 Dealers in the Population and the 101 Sample Dealers by Oklahoma Counties

Questions relating to credit arrangements were answered by 100 firms. Ninety-four dealers answered questions relating to both credit arrangements and credit performance. Figure 4 shows the number of firms in each county that responded to the questionnaire (numbers in parentheses). The 101 dealers are located in 41 counties. Only one county with fertilizer sales of over 12,000 tons is not represented among the sample firms. Fifty-eight of the 101 dealers are located in the 17 counties with over 12,000 tons of fertilizer sales.

Dealer Characteristics

Type of Firm

There were 48 cooperatives, 43 independent dealers and 10 company stores that responded to the questionnaire. All cooperatives and independent dealers who own branch offices reported the main office and all branches as a single firm. The company stores include both company-owned stores and lease-agent operations. The company-owned stores are usually owned and managed directly by a fertilizer manufacturer. The manufacturer usually owns the facilities in the lease-agent arrangement, but the local firm leases and manages the fertilizer facilities. Each retail location owned by the manufacturer is considered as a single firm.

Sales Characteristics

Ninety-seven dealers reported their total sales and fertilizer sales for the last fiscal year. Their total sales of all products and services range from $35,000 to $6 million per firm (Table IV). The

TABLE IV

DISTRIBUTION OF DEALERS ACCORDING TO TOTAL SALES AND TYPE OF FIRM, 97 DEALERS

Type of Firm	Total Sales (Million Dollars)							Average	Range
	.5 or less	.51-1.0	1.01-1.5	1.51-2.0	2.01-2.5	2.51-3.0	3.01 or more		
	(Number of Firms)							($)	($)
Cooperative	4	11	9	9	7	3	5	1,659,816	165,000-5,965,306
Independent Dealer	23	10	2	2	1	1	1	767,585	35,000-6,000,000
Company Store	9	0	0	0	0	0	0	236,808	40,000-410,000
All Firms	36	21	11	11	8	4	6	1,159,852	35,000-6,000,000

average total sales per firm is $1,159,852. Table IV shows the number of firms in each discrete interval of total sales according to the alternative types of firms. Thirty-six firms have $500,000 or less in total sales. Cooperatives have the largest average total sales ($1,659,816) and also a more even distribution over all size groups. All company stores have total sales less than $500,000. One-half (23) of the independent dealers have less than $500,000 in total sales.

The average fertilizer sales for all firms is $159,956 (Table V). The range is from $2,785 to $486,567. Of the 19 firms in the greater than $250,000 fertilizer sales group, seven have greater than $350,000 in fertilizer sales. Six of these are cooperatives. Company stores have the largest average fertilizer sales ($223,753) per firm and independent dealers the smallest ($133,654).

The dealer's average fertilizer sales expressed as a percent of total sales is 32.3 percent (Table VI). The firms with the largest total sales have the smallest percentage of total sales as fertilizer sales. Cooperatives who have the largest average total sales, have an average of 11.33 percent of total sales as fertilizer sales. Forty-five (94 percent) of the cooperative firms have less than 25 percent of sales as fertilizer sales, indicating that fertilizer is not their main product. Most cooperatives are grain-supply firms handling large amounts of wheat and selling a variety of farm supplies in addition to fertilizer. The independent dealers have the largest variation among firms in percent fertilizer. Some independents sell primarily fertilizer while others sell fertilizer along with other products such as grain, feed, seed, or farm equipment. All company stores have at least 85 percent of their total sales as fertilizer sales.

TABLE V

DISTRIBUTION OF DEALERS ACCORDING TO FERTILIZER SALES AND TYPE OF FIRM, 97 DEALERS

Type of Firm	Fertilizer Sales ($)				Average	Range
	50,000 or less	51,000-150,000	151,000-250,000	More than 250,000		
	(Number of Firms)				($)	($)
Cooperative	5	19	15	9	169,912	2,785-450,000
Independent Dealer	7	21	7	5	133,654	15,307-486,567
Company Store	2	1	1	5	223,753	40,000-350,000
All Firms	14	41	23	19	159,956	2,785-486,567

TABLE VI

DISTRIBUTION OF DEALERS ACCORDING TO FERTILIZER SALES AS A PERCENT OF TOTAL SALES AND TYPE OF FIRM, 98 DEALERS

Type of Firm	Fertilizer Sales as a Percent of Total Dealer Sales				
	25 or less	26-75	76 or more	Average	Range
	(Number of Firms)			(%)	(%)
Cooperative	45	3	0	11.33	.4-37.6
Independent Dealer	17	14	9	41.43	.4-100
Company Store	0	0	10	96.45	85-100
All Firms	62	17	19	32.30	.4-100

Customer Services

The fertilizer dealers were asked to indicate which services associated with the sale of fertilizer are offered by their firm. The last column of Table VII shows the number of firms and the percent of all firms which offer the selected services to their customers. Ninety-six of the 101 dealers surveyed accept their customers' credit. Nearly all firms (97 percent) furnish fertilizer applicators to their customers. Approximately 60 percent of these firms indicated that the customer is charged for the applicator. About two-thirds (64 percent) of all dealers indicated that they load fertilizer for their customers after their normal hours of operation. Over half (58 percent) of all firms offer soil testing to their customers, with about one-quarter (24 percent) of those firms charging their customers for this service. Over

TABLE VII

DISTRIBUTION OF DEALERS OFFERING SELECTED CUSTOMER SERVICES ACCORDING TO TYPE OF FIRM, 101 DEALERS

Service Offered	Significance Level[a]	Type of Firm			All Firms
		Cooperative	Independent Dealer	Company Store	
		(Number of Firms)[b]			
Credit		44	42	10	96
		(92)	(98)	(100)	(95)
Applicator Furnished		45	43	10	98
		(94)	(100)	(100)	(97)
Custom Application	#	19	26	7	52
		(40)	(60)	(70)	(51)
Fertilizer Delivery	**	20	28	9	57
		(42)	(65)	(90)	(56)
Loading After Hours	#	26	30	9	65
		(54)	(70)	(90)	(64)
Field Help		18	22	5	45
		(38)	(55)	(50)	(45)
Soil Testing	*	21	30	8	59
		(44)	(70)	(80)	(58)
Educational Meetings	*	20	28	7	55
		(42)	(65)	(70)	(54)
Farm Planning Programs	**	5	15	6	25
		(10)	(33)	(60)	(25)
No. of Firms in Each Class		48	43	10	101

[a]The significance level (α) for alternative types of firms is designated as ** ($\alpha \leq .01$), * ($.01 < \alpha \leq .05$), and # ($.05 < \alpha \leq .10$).

[b]Numbers in parentheses indicate the percent of dealers in each type that offer each service.

half (56 percent) of all firms deliver fertilizer to the farmer and 51 percent offer custom application of fertilizer. A large proportion of the firms (85 percent) charge for custom application. Approximately 54 percent of all firms have educational meetings, 45 percent offer field help, and 25 percent have farm planning programs.

A chi-square test[2] is used to determine if there is any significant difference in the proportion of dealers offering each selected service among the alternative types of firms and among alternative fertilizer sales classes. The null hypothesis tested is that the proportion of dealers offering each service is the same for all classes of dealers. The null hypothesis is rejected if the calculated chi-square yields a value whose associated probability of occurrence under the null hypothesis is less than or equal to the significance level chosen (α). The null hypothesis is rejected in favor of the alternative hypothesis that the proportion of dealers in each class that offer a service is different. The significance level (α) is the probability that the chi-square test will yield a value under which the null hypothesis will be rejected when it is true.[3] The significance level chosen for the test is .10.

With the exception of credit, applicator, and field help, there are significant differences ($\alpha \leq .10$) in the proportion of firms offering each service among the alternative types of firms (see Table VII). A larger percentage of the independent dealers offer each of the services than do cooperatives. For example, 60 percent of the independent dealers offer custom application whereas only 40 percent of the cooperatives offer this service. With the exception of field help and furnishing an applicator, a larger percentage of the company stores offer each service than either independent dealers or cooperatives.

In general, a greater percentage of the firms with larger fertilizer sales offer the selected services than do the firms with smaller sales (see Table VIII). For example, 21 percent of the firms having $50,000 or less in fertilizer sales offer soil testing. As fertilizer sales increase, 59 percent, 61 percent, and 74 percent of the firms in each size group, respectively, offer soil testing. Only 28 percent of the small firms ($50,000 or less) offer custom application, while 68 percent of the large firms (more than $250,000) offer this service. This same size relationship holds, in general, for all other services. The chi-square test indicates that significant differences exist among the fertilizer sales classes in the proportion of firms offering custom application, fertilizer delivery, loading after hours, soil testing and educational meetings ($\alpha \leq .05$) for each of these services).

In addition to the firm characteristics shown in Tables VII and VIII, services are offered more frequently by dealers who have a larger proportion of their total sales for fertilizer than those with a small percentage of fertilizer sales. A chi-square test indicates that significant differences exist among the alternative classes of percent fertilizer sales in the proportion of firms offering custom application, delivery, soil testing, and farm planning programs ($\alpha \leq .10$).

Managerial Attitudes Toward Financing

Dealers were asked to rank five possible reasons for accepting trade credit. Forty-seven firms gave a complete ranking of all five reasons. Eighty-six dealers ranked at least two of the reasons. Table IX shows the percent of the dealers who ranked each reason either first or second. The majority of the firms ranked "maintain or increase market share of

TABLE VIII

DISTRIBUTION OF DEALERS OFFERING SELECTED CUSTOMER SERVICES ACCORDING TO FERTILIZER SALES, 97 DEALERS

Service Offered	Significance Level[a]	Fertilizer Sales ($) 50,000 or Less	51,000 to 150,000	151,000 to 250,000	More Than 250,000
		(Number of Firms)[b]			
Credit		12	38	28	19
		(86)	(93)	(100)	(100)
Applicator Furnished		11	41	23	19
		(79)	(100)	(100)	(100)
Custom Application	*	4	17	15	13
		(28)	(41)	(65)	(68)
Fertilizer Delivery	**	8	18	10	17
		(57)	(44)	(43)	(89)
Loading After Hours	*	5	24	18	14
		(36)	(59)	(78)	(74)
Field Help		3	16	13	10
		(21)	(39)	(57)	(53)
Soil Testing	*	3	24	14	14
		(21)	(59)	(61)	(74)
Educational Meetings	*	5	17	15	15
		(36)	(41)	(65)	(79)
Farm Planning Programs		1	8	7	6
		(7)	(19)	(30)	(32)
No. of Firms in Each Class		14	41	23	19

[a]The significance level (α) for the fertilizer sales groups is designated as ** ($\alpha \leq .01$), * ($.01 < \alpha \leq .05$), and # ($.05 < \alpha \leq .10$).

[b]The numbers in parenthesis indicate the percent of dealers in each size class that offer each service.

sales" or "convenience to buyers" as their first or second choice of reasons for offering credit. Approximately 73 percent of all firms ranked market share as either the first or second reason for offering credit to customers. A total of 60 percent of the firms indicated convenience to buyers as their first or second choice of reasons for offering credit. About 11 percent of the firms specified "other" reasons as their first or second choice. Most "other" reasons are actually similar to the market share reason.

TABLE IX

RANKING OF SELECTED REASONS FOR OFFERING SALES FINANCING

Reasons	Percent of Dealers Ranking Reason 1st or 2nd	Average Rank
Maintain or Increase Market Share of Sales	73	1.4
Increase Net Profit	18	3.0
Make Money on Finance Charges	2	4.7
Convenience to Buyers	60	2.3
Increase Fertilizer Sales In Off-Season	8	3.6
Other Reasons[a]	11	--
Total Number of Firms Ranking Reasons	86	47

[a]Other reasons were primarily to compete with other firms offering credit.

Only 18 percent of the firms indicated that increasing net profit is either the first or second most important reason for offering credit. This may suggest that most firms are more concerned with sales rather than profits when determining their credit arrangements.

Table IX also shows the average rank assigned to each of the reasons by the 47 dealers providing a complete ordering. (The lower numbers have the higher ordinal ranking.) The ordering of the reasons is consistent with the percentage of firms ranking each reason first or second. The ranking of the five reasons by alternative types of firms is consistent with the ranking provided by all firms.

A statistical test (Kendall Rank Coefficient of Concordance) is used to determine if there is a significant degree of agreement among the 47 firms in ranking the five reasons.[4] The degree of agreement among the firms in ranking the five reasons is measured by a rank coefficient (W) calculated as:

$$W = \frac{S}{(1/12)K^2(N^3-N)} \qquad 0 \leq W \leq 1 \tag{3-1}$$

where:

$$S = \sum_{j=1}^{N} [R_j-(R_j/N)]^2,$$

N = number of reasons to be ranked = 5,

K = number of firms ranking the reasons = 47, and

R_j = sum of rankings for the jth reason.

To test the significance of the rank coefficient (W), one can use a chi-square test with N-1 degrees of freedom, where:

$$\chi^2 = K(N-1)W. \tag{3-2}$$

The null hypothesis that the 47 rankings are unrelated is rejected at the .01 level of significance if the calculated chi-square is greater than 13.3. A high or significant rank coefficient (W) means that the 47 dealers are applying essentially the same standards in ranking the reasons.

The rank coefficient (W) resulting from the ordering of the five reasons by the 47 dealers is .6277. The chi-square is 118. The rank coefficient is significant at the .005 level. Thus, there is a significant degree of agreement among the dealers in ranking the reasons.

The managers were also asked to give their opinion as to the effect of sales financing on their profits. Ninety-four firms responded to the question. If increasing net profit is the goal of fertilizer dealers, then Table X may suggest that credit extension is not having the desired effect for many firms. Approximately 14 percent of all firms indicated that extending credit to buyers of fertilizer decreases the net profit of their firms. Most firms indicated that this decline occurs because working capital is tied up in credit accounts and they have to borrow funds to carry on their operation. There are no significant differences in the answers to this question between the alternative types of firms.

TABLE X

THE EFFECT OF DEALER FINANCING ON NET PROFIT, 94 DEALERS

Effect on Profit	Number of Firms	Percent of Firms
Increased	38	40.4
Decreased	13	13.8
No Effect	43	45.7

Use of Alternative Credit Policies

Approximately 75 percent of all fertilizer sold by the sample dealers is financed with trade credit. For a particular fertilizer dealer, the proportion of sales on credit and the length of time a sale is financed depends upon the dealer's credit arrangement. The types of credit arrangements utilized varies among the dealers. The objective of this section is to describe the credit policies according to credit instruments and credit decision variables and relate each to selected dealer characteristics.

Credit Instruments

The credit instruments utilized by the fertilizer dealers to finance their sales are open accounts and promissory notes. As shown in Table XI, five of the 100 firms do not accept the customers' credit and sell only for cash on the purchase date. Two firms use only notes, 60 firms use only open accounts, and 33 dealers use both accounts and notes to finance their credit sales.

Four (80 percent) of the dealers that sell only for cash are cooperatives. The two dealers financing all credit sales with notes are also cooperatives. A larger proportion of the cooperatives utilize notes than do independent dealers or company stores. Approximately 45 percent (41 + 4) of the cooperatives use notes to finance part of their credit sales compared to 24 percent for the independent dealers and 30 percent for company stores. A larger proportion of the independent dealers (74 percent) and company stores (70 percent) use open accounts to finance all credit sales than do cooperatives (46 percent).

TABLE XI

AVERAGE FERTILIZER SALES AND DISTRIBUTION OF DEALERS BY TYPE OF FIRM ACCORDING TO THE TYPE OF CREDIT INSTRUMENT USED, 100 DEALERS

Instrument	All Firms	Firm Characteristics				
		Type			Fertilizer Sales ($)	
		Cooperative	Independent Dealer	Company Store	Average Per Firm	Number Reporting
		(Number of Firms)				
Cash Policy	5	4 (8)	1 (2)	0 (0)	57,625	(5)
Note Policy	2	2 (4)	0 (0)	0 (0)	120,439	(2)
Account Policy	60	22 (46)	31 (74)	7 (70)	153,701	(56)
Account-Note Policy	33	20 (41)	10 (24)	3 (30)	191,590	(33)
Total	100	48	42	10	161,028	(96)

[a]Percent of firms in each type with the alternative credit instrument.

To relate the use of alternative credit instruments to the size of the firm, the average fertilizer sales for dealers using each instrument is considered. (Only 96 of the 100 firms reported their fertilizer sales.) The firms which do not accept credit have the smallest average fertilizer sales ($57,625). The dealers with both note and account instruments have a larger average fertilizer sales ($191,590) than those in the accounts only ($153,701) class.

Credit Policy Variables

Account Policies. As shown in Table XI, 93 dealers are using the open account instrument to finance some of their credit sales. The open account policies are classified according to the use of selected credit decision variables (Table XII). All account policies specify an account due period, but the policies differ in the use of cash discounts and finance charges. Sixteen (17 percent) of the dealers selling with open accounts do not offer customers cash discounts or impose a finance charge on late payments. Forty-three (46 percent) of the dealers with accounts impose a finance charge on late payments, but do not offer a cash discount for an early payment. Eight dealers (9 percent) offer a cash discount but do not impose a finance charge. Twenty-six dealers (28 percent) offer a cash discount and impose a finance charge.

A larger proportion of the firms that do not offer a cash discount nor impose a finance charge use notes to finance some of their credit sales compared to firms with other account policies. Seven of the 16 firms (44 percent) with the account due period only policy offer note financing in addition to account financing. These firms may issue notes to their customers when the account is due rather than impose a finance

TABLE XII

AVERAGE FERTILIZER SALES AND DISTRIBUTION OF DEALERS BY TYPE OF FIRM ACCORDING TO THE TYPE OF ACCOUNT POLICY USED, 93 DEALERS

Policy	All Firms	Offer Notes	Type of Firm			Average Fertilizer Sales	
			Cooperative	Independent	Company Store		
			(Number of Firms)			($)	(Number of Firms)
Account Due Period	16 (17)	7	9 (21)[a]	7 (17)	0 (0)	181,652	15
Account Due Period-Finance Charge	43 (46)	15	25 (60)	16 (39)	2 (20)	152,965	41
Account Due Period-Cash Discount	8 (9)	3	1 (2)	6 (15)	1 (10)	120,375	8
Account Due Period-Finance Charge-Cash Discount	26 (28)	8	7 (17)	12 (29)	7 (70)	198,815	25
All Firms	93	33	42	41	10	167,750	89

[a]Percent of firms in each class with each alternative account policy.

charge on late accounts. Thirty-five percent (15/43 x 100) and 31 percent (8/26 x 100) of the dealers imposing a finance charge without a cash discount and with a cash discount, respectively, offer note financing.

Table XII also shows the distribution of the dealers with the alternative account policies according to type of firm. A larger proportion of the cooperative firms (60 percent) offer the account due period-finance charge policy than do independent dealers (39 percent) or company stores (20 percent). Seventy percent of the company stores have an account policy with both finance charges and cash discounts, compared to 29 percent and 17 percent for independents and cooperatives, respectively. All of the company stores have either a finance charge or a cash discount.

Table XII also shows the average fertilizer sales for the dealers using each account policy. (There are 89 dealers with account policies which reported their fertilizer sales.) The dealers with both finance charges and cash discount policies have the largest average fertilizer sales ($198,815). However, the dealers with neither a finance charge nor a cash discount have larger average fertilizer sales ($181,652) compared to those having a finance charge ($152,965) or a cash discount ($120,375) only.

The lengths of the account due periods for firms with accounts range from 30 days to the time of crop harvest. The length of the account due period when crop harvest terms are offered depends on the kind of crop fertilized and the time of fertilizer application. For example, if fertilizer is applied to wheat at the time of planting (September 15), the account due period under crop harvest terms is

approximately 270 days. (Assume that wheat is harvested on June 15.) However, if the fertilizer is applied to growing wheat on February 15, the account due period is approximately 120 days. If fertilizer is applied on cotton at the time of planting (May 1), the account due period is approximately 180 days. (Assume cotton is harvested on November 1.) The various account due periods for the dealers are grouped as 30-day, 30-90 day, crop terms, and other terms (Table XIII). The "other" terms are either accounts due at 120 days from the date of purchase or accounts due on two specified dates during the year such as December 1 and June 1.

Table XIII shows the number of firms having the alternative account due periods for the 93 dealers with account policies. Approximately 33 percent of the firms have 30-day; 20 percent, 31 to 90-day; 39 percent, crop harvest; and 8 percent, other account due periods. A larger proportion of cooperatives (52 percent) have 30-day account due periods than independent dealers (20 percent) or company stores (10 percent). Independent dealers and company stores appear to have longer due periods than cooperatives. Only 17 percent of the cooperatives have crop harvest due periods compared to 59 percent and 50 percent for independent dealers and company stores, respectively.

The finance charge rates for dealers imposing a finance charge range from .5 to 1.5 percent per month. Table XIII shows the number of dealers with account policies who impose alternative finance charge rates. Sixty-nine dealers (74 percent of dealers with accounts) have a finance charge. Forty-six dealers (49 percent) charge 1.0 to 1.4 percent per month on past-due accounts and 19 dealers (20 percent) charge 1.5 percent per month.

TABLE XIII

DISTRIBUTION OF FIRMS WITH VARIOUS ACCOUNT DECISION VARIABLES, ACCORDING TO TYPE OF FIRM AND ACCOUNT DUE PERIOD, 93 DEALERS

Account Decision Variable	Type of Firm						Account Due Period								All Firms	
	Cooperative		Independent Dealer		Company Store		30		31-90		Crop		Other			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Account Due Period (days)																
30	22	(52)[a]	8	(20)	1	(10)									**31**	**(33)**
30-90	11	(26)	5	(12)	3	(30)									**19**	**(20)**
Crop Harvest	7	(17)	24	(59)	5	(50)									**36**	**(39)**
Other	2	(5)	4	(10)	1	(10)									**7**	**(8)**
Finance Charge Rate (% per month)																
.5-.9	1	(2)	3	(7)	0	(0)	1	(3)[b]	1	(5)	2	(6)	0	**(0)**	**4**	**(4)**
1.0-1.4	17	(40)	20	(49)	9	(90)	12	(39)	9	(47)	20	(59)	5	**(71)**	**46**	**(49)**
1.5	14	(33)	5	(12)	0	(0)	10	(32)	7	(37)	2	(6)	0	**(0)**	**19**	**(20)**
Total	32	(76)	28	(68)	9	(90)	23	(74)	17	(89)	24	(71)	5	**(71)**	**69**	**(74)**
Finance Charge Period (days)																
30	11	(26)	8	(20)	2	(20)	15	(48)	2	(11)	3	(9)	1	**(14)**	**21**	**(23)**
31-60	13	(31)	4	(10)	4	(40)	8	(26)	6	(32)	5	(15)	2	**(29)**	**21**	**(23)**
61-90	7	(17)	4	(10)	0	(0)	0	(0)	8	(42)	1	(3)	2	**(29)**	**11**	**(12)**
91 or more	1	(2)	12	(49)	3	(30)	0	(0)	1	(5)	15	(44)	0	**(0)**	**16**	**(17)**
Cash Discount Rate (%)																
2	6	(14)	15	(37)	3	(30)	3	(10)	6	(32)	14	(39)	1	**(14)**	**24**	**(26)**
3 or more	2	(5)	3	(7)	5	(50)	2	(6)	1	(5)	5	(14)	2	**(29)**	**10**	**(11)**
Total	8	(19)	18	(44)	8	(80)	5	(16)	7	(37)	19	(53)	3	**(43)**	**34**	**(37)**
Cash Discount Period (days)																
20 or less	3	(7)	5	(12)	2	(20)	1	(3)	1	(5)	5	(14)	3	**(43)**	**10**	**(11)**
30 or more	5	(12)	13	(32)	6	(60)	4	(13)	6	(32)	14	(39)	0	**(0)**	**24**	**(26)**
All Firms	42		41		10		31		19		36		7		**93**	

[a] Percent of type with each note decision variable.

[b] Percent of dealers with each account due period with each decision variable.

Table XIII also shows the relationship between the alternative account due periods and the finance charge rates. A larger proportion of the dealers with 30-day due periods (32 percent) and 31-90 day due periods (37 percent) charge 1.5 percent per month compared to the dealers with crop terms (6 percent). However, a larger proportion of dealers with crop and other account due periods charge one percent per month than the dealers with 30 and 31-90 day due periods. A slightly smaller percent (71 percent) of the dealers with crop terms impose a finance charge than dealers with 30-day, 31-90 day, or other due periods. Dealers with crop terms may not impose a finance charge because the farmer will likely pay the dealer when he receives the receipts from his crop. Only one company store did not have a finance charge. The other nine company stores charge one percent per month. A larger proportion of the cooperatives impose a finance charge (76 percent) than do independent dealers (68 percent). Also, a larger proportion of the cooperatives have higher finance charge rates than independent dealers. Thirty-three percent of the cooperatives charge 1.5 percent per month compared to 12 percent of the independent dealers.

The time the finance charge is imposed, the finance charge period, is usually the same as the account due period. However, as shown in Table XIII, some dealers have finance charge periods different than their account due periods. Twenty-six percent of the dealers with 30-day account due periods have finance charge periods from 31 to 60 days. Eleven percent of the dealers with 31 to 90 day account due periods have 30-day finance charge periods and five percent (one dealer) have finance charge periods that are more than 90 days. Twenty-seven percent (15 + 3 + 9) of the dealers with crop harvest due periods have

finance charge periods less than or equal to 90 days. Only one cooperative firm has a finance charge period of 90 or more days. Twenty-nine percent of the independent dealers and 30 percent of the company stores have finance charge periods longer than 90 days.

Thirty-four dealers offer a cash discount for payments made during the cash discount period. Only two dealers offer more than a three percent cash discount. A larger proportion of the dealers with crop harvest due periods offer a cash discount than do dealers with 30-day or 31-90 day due periods. Also, a larger proportion of the company stores and independent dealers offer a cash discount than cooperatives.

The cash discount periods (the number of days from the purchase date to the date the payment must be made to receive a cash discount) for the dealers offering a cash discount range from the date of purchase to 60 days after the purchase date. More dealers have cash discount periods of 30 days or longer (24 dealers) than 20 days or less (10 dealers). Even of the dealers with 30-day account due periods, more have 30-day cash discount periods than the 20-day or less periods.

Note Policies. Thirty-five of the dealers use notes to finance at least a part of their credit sales. Only two dealers use notes to finance all of their credit sales. The note payment periods (the average length of time from the date notes are issued to the due date) for the dealers with notes range from 3 to 10 months. Table XIV shows the number and percent of the dealers with various note due periods. The largest percentage of all firms' notes are due in 5 to 6 months from the issue date (51 percent). All three of the company stores with notes

TABLE XIV

DISTRIBUTION OF DEALERS WITH VARIOUS NOTE DECISION VARIABLES, ACCORDING TO TYPE OF FIRM AND NOTE PAYMENT PERIOD, 35 DEALERS

Note Decision Variable	Type of Firm						Note Payment Period (months)								All Firms	
	Cooperative		Independent Dealer		Company Store		3-4		5-6		7-8		9-10			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Note Payment Period (months)																
3-4	0	(0)[a]	4	(40)	3	(100)									7	(20)
5-6	14	(64)	4	(40)	0	(0)									18	(51)
7-8	5	(23)	1	(10)	0	(0)									6	(17)
9-10	3	(14)	1	(10)	0	(0)									4	(11)
Annual Interest Rate (%/year)																
0	0	(0)	2	(20)	1	(33)	2	(29)[b]	1	(6)	0	(0)	0	(0)	3	(6)
7-8	10	(45)	1	(10)	1	(33)	1	(14)	7	(40)	3	(50)	1	(25)	12	(34)
9-10	9	(41)	5	(50)	0	(0)	2	(29)	6	(33)	3	(50)	3	(75)	14	(40)
11-12	3	(14)	2	(20)	1	(33)	2	(29)	4	(22)	0	(0)	0	(0)	6	(17)
Issue Date (days)																
0-20	5	(23)	4	(40)	0	(0)	2	(29)	4	(22)	1	(17)	2	(50)	9	(26)
30	12	(54)	2	(20)	2	(67)	2	(29)	8	(44)	4	(67)	2	(50)	16	(46)
60	4	(18)	4	(40)	0	(0)	2	(29)	5	(28)	1	(17)	0	(0)	8	(23)
90 or more	1	(5)	0	(0)	1	(33)	1	(14)	1	(6)	0	(0)	0	(0)	2	(6)
All Firms	22		10		3		7		18		6		4		35	

[a]Percent of type with each note decision variable.

[b]Percent of dealers with each note payment period with each alternative note decision variable.

have due periods from 3 to 4 months. All of the notes issued by cooperatives are due in five or more months.

The annual interest rates charged on notes range from zero to 12 percent. Six percent of the dealers with notes charge no interest if the notes are paid during the note due period. Thirty-four percent, 40 percent, and 17 percent charge 7 to 8 percent, 9 to 10 percent and 11 to 12 percent, annual interest rates, respectively. All cooperative firms charge seven percent or more annual interest rates. However, a larger proportion of the independent dealers with notes charge nine percent or more (70 percent) compared to cooperatives (55 percent). Table XIV also shows the number and percent of firms with the various note payment periods charging alternative interest rates. Forty percent of the dealers with 5 to 6-month note due periods have 7 to 8 percent annual interest rates, 33 percent have 9 to 10 percent rates, and 22 percent have 11 to 12 percent rates.

Notes are issued either on the purchase date or after the sale is carried on an open account for some period of time. The issue date ranges from the purchase date to 120 days after the purchase date. Twenty-six percent of the dealers with notes issue them within 20 days of the purchase date. Forty-six percent, 23 percent, and 6 percent issue notes in 30, 60, and 90 or more days, respectively. In general, the longer note payment periods are associated with the shorter note issue dates. Only one dealer with a note due period of seven or more months has an issue date of 60 or more days.

Standards and Collection Practices. The dealers were also asked questions concerning their credit standards and credit collection practices. The alternative types of statements required of new credit

customers is one measure of a dealer's credit standards. Table XV shows the number and percent of the 95 dealers selling on credit terms who require the selected statements from new customers. The most common credit statement required of new customers is a formal credit application (46 percent of all firms selling on credit require this statement). Only 11 percent of the dealers require a financial statement. The "other statement" most often used by firms is an oral interview with the new customer. (Twenty-one percent of the dealers selling on credit required "other statements".) However, 31 percent of the firms do not require any statement of new customers who buy on credit. These data suggest that many managers feel they know the payment capability of most farmers in their trade area. The proportion of cooperatives requiring no statement is higher than either independent dealers or company stores. A higher proportion of company stores require formal credit applications than either cooperatives or independent dealers.

A written notice once a month is the most common collection practice used by fertilizer dealers (79 percent of all firms use this practice). About one-half of all firms personally visit with the farmer when an account is past-due. The most common practice indicated in the "other means of collection" group is the use of a collection agency. There is little difference in the collection practices used by the different types of firms.

Credit Performance

The objective of this section is to describe the data obtained from the fertilizer dealers concerning their credit performance. The credit performance variables analyzed are the proportion of sales for cash, on

TABLE XV

DISTRIBUTION OF DEALERS WITH VARIOUS STATEMENTS REQUIRED AND COLLECTION PRACTICES UTILIZED ACCORDING TO TYPE OF FIRM, 95 DEALERS[a]

Credit Policy Variable	Type of Firm						All Firms	
	Cooperative		Independent		Company Store			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Statement Required								
Formal Credit Application	16	(36)	20	(49)	8	(80)	44	(46)
Financial Statement	3	(7)	5	(12)	2	(20)	10	(11)
Other Statement	13	(30)	7	(17)	0	(0)	20	(21)
No Statement	18	(41)	10	(24)	1	(10)	29	(31)
Collection Practice								
Written Notice Once a Month	35	(80)	32	(78)	8	(80)	75	(79)
Written Notice When Account is Due	15	(34)	16	(39)	5	(50)	36	(38)
Personal Visit After Account is Due	24	(54)	21	(51)	5	(50)	50	(53)
Other Means of Collection	9	(20)	6	(15)	2	(20)	17	(18)
Number in Each Type	44		41		10		95	

[a]Dealers may require more than one statement and utilize more than one collection practice.

accounts, and on notes; the proportion of account sales paid in alternative payment intervals and the collection period on account sales. The credit performance variables are compared for selected dealer characteristics and the alternative credit policies. A more detailed statistical analysis of the relationship between credit decision variables and the credit performance variables is presented in Chapter IV.

Percent of Sales for Cash, On Account and On Notes

Ninety-four dealers completed the section of the questionnaire concerning their credit performance. The average percent of fertilizer sales per dealer paid for in cash on the purchase date is 29.3 percent (see Table XVI). Five of the 94 dealers have 100 percent of their sales for cash. Sales for cash could also include those sales for which the dealer arranges for financing with the local bank. The dealer usually receives payment from the bank near the purchase date. The average percent per firm for this type of financing is 1.2 percent. All sales other than cash sales or those financed by the local bank are financed either by the dealer or his supplier (fertilizer manufacturer or wholesale distributor). If the dealer's fertilizer supplier finances the customer's purchase, the local dealer is usually paid by the fertilizer supplier at some time after the purchase date, but before the customer pays for the purchase. In this case, the supplier rather than the local dealer, has funds tied up in credit receivables. The average percent of fertilizer sales financed with an open account instrument (firm and supplier) is 61.6 percent per dealer. The average percent of fertilizer sales financed with a note instrument is eight percent. The suppliers finance an average of 27 percent of the fertilizer

TABLE XVI

AVERAGE PERCENT OF FERTILIZER SALES FOR CASH AND FINANCED ACCORDING TO FIRM CHARACTERISTICS, 94 DEALERS

Firm Characteristic	Number of Dealers	Average Percent of Fertilizer Sales					
		Cash	Dealer Account	Supplier Account	Dealer Note	Supplier Note	Local Bank
All Firms	94	29.27	39.36 (61.58)[a]	22.22	3.09 (7.99)[b]	4.90	1.16
Firms With Credit Sales	89	25.29	41.57 (65.04)	23.47	3.28 (8.46)	5.18	1.22
Firms With Accounts	87	24.44	42.53 (66.54)	24.01	2.76 (7.77)	5.01	1.25
Type of Firm[c]							
Cooperative	37	21.35	59.08 (64.89)	5.81	4.46 (11.35)	6.89	2.41
Independent Dealer	40	28.28	36.98 (67.08)	30.10	1.63 (4.53)	2.90	.13
Company Store	10	20.50	3.50 (70.50)	67.00	1.00 (7.50)	6.50	1.50
Fertilizer Sales ($)[c]							
≤50,000	10	55.00	28.00 (45.00)	17.00	.00 (0)	.00	.00
51,000-150,000	33	23.67	43.91 (67.70)	23.79	2.42 (8.33)	5.91	.30
151,000-250,000	22	18.09	54.23 (64.46)	10.23	5.68 (13.63)	7.95	3.82
>250,000	18	19.28	40.72 (74.28)	33.56	1.94 (5.61)	3.67	.83

[a]Average percent of fertilizer sales on dealer and supplier accounts.

[b]Average percent of fertilizer sales on dealer and supplier notes.

[c]Includes only firms with accounts.

sales (22 percent with accounts and 5 percent with notes).

The 89 dealers (excluding five dealers with 100 percent of sales for cash) who sell with either accounts, notes, or both, have an average of 25.3 percent of their sales for cash. Sixty-five percent of their sales are on accounts and 8.5 percent are on notes. Over 28 percent of their fertilizer sales are financed by the supplier (23.47 + 5.18). The suppliers finance a larger share of the note sales than the account sales.

The average percent of sales for cash, on account, and on notes for the 87 dealers which have account policies (excluding two dealers with only notes), are compared for the alternative types of firms. The company stores and cooperatives appear to be financing a larger proportion of their fertilizer sales than are independent dealers. The average percent of sales paid in cash is 20.5 percent for company stores and 21.4 percent for cooperatives, whereas the average for independent dealers is 28.3.[5] The cooperatives finance a larger proportion of their sales with notes (11.4 percent). However, independent dealers and company stores finance a slightly larger proportion of their sales with accounts than do cooperatives. Comparing the proportion of sales financed by the local dealers (both notes and accounts) to those financed by the dealer's suppliers, the cooperatives finance a larger proportion of their sales (63.5 percent) than do independent dealers (38.6 percent) or company stores (4.5 percent). Nearly all of the company stores' credit sales are financed by their suppliers.

Table XVI also shows the average percent of fertilizer sales for cash, on accounts, and on notes for the dealers according to their volume of fertilizer sales. The dealers having the smallest volume of

fertilizer sales (less than or equal to $50,000) have the highest average percent of fertilizer sales for cash (55 percent). In general, the larger the volume of fertilizer sales, the higher the percent of fertilizer sales on accounts.

Table XVII shows the average percent of fertilizer sales purchased in cash, on account, and on notes for alternative account arrangements. The dealers who finance all credit sales with account instruments have an average of 28.2 percent of their sales for cash compared to 17.3 percent for the dealers with credit sales on both accounts and notes. The dealers with only accounts have 71.1 percent of their sales on account (dealer and supplier). The dealers with accounts and notes have 57.9 percent on accounts and 22.5 percent on notes. A larger proportion of sales for the dealers who offer notes are financed by the supplier than are the sales of dealers with only accounts.

There does not appear to be much difference in the percent of fertilizer sales for cash and on accounts for the alternative account policies. However, the dealers who do not offer cash discounts nor impose a finance charge (the account due period policy) have a larger average percent of sales financed with notes than do dealers with finance charges, cash discounts or both.

Payment Distribution and Average Collection Period

As discussed in Chapter II, the distribution of payments for account sales by their age at the time of collection is used to describe the farmer's payment behavior. The proportion of sales paid in each payment interval and the approximate age at time of collection is used

TABLE XVII

AVERAGE PERCENT OF FERTILIZER FOR CASH AND FINANCED ACCORDING TO TYPE OF ACCOUNT POLICY USED, 87 DEALERS

Account Arrangement	Number of Dealers	Average Percent of Fertilizer Sales					
		Cash	Dealer Account	Supplier Account	Dealer Note	Supplier Note	Local Bank
All Account Firms	87	24.44	42.53 (66.54)[a]	24.01	2.76 (7.77)[b]	5.01	1.25
Instruments							
Account Only	57	28.19	45.32 (71.11)	25.79			.70
Account-Note	30	17.30	37.23 (57.86)	20.63	8.00 (22.53)	14.53	2.30
Account Policy							
Account Due Period	12	21.42	41.92 (66.42)	24.50	1.67 (12.17)	10.50	.00
Account Due Period Finance Charge	41	26.02	49.85 (64.85)	15.00	3.54 (7.81)	4.27	1.32
Account Due Period Cash Discount	8	25.13	47.38 (67.38)	20.00	4.38 (5.63)	1.25	1.88
Account Due Period Finance Charge-Cash Discount	26	23.08	29.77 (69.00)	39.23	1.54 (6.35)	4.81	1.54

[a]Average percent of fertilizer sales on dealer and supplier accounts.

[b]Average percent of fertilizer sales on dealer and supplier notes.

to compute an average collection period. The approximate age at the time of collection assumed for payments made in each payment interval is shown below.

Payment Interval		Age at Time of Collection
1st	1-30 days	30 days
2nd	31-90 days	60 days
3rd	91-180 days	135 days
4th	181-365 days	270 days
5th	> 365 days	365 days

The approximate age of payments made in the second, third and fourth payment interval is assumed to be the median day of that interval. It is also assumed that all payments made during the first interval are paid on the 30th day, and that all sales paid after one year are paid in 365 days from the purchase date. Since the average collection period is a measure of the average length of time account sales are invested in receivables, the proportion of sales not paid (bad debts) are included in the calculations. It is assumed that the sales not paid for are invested in receivables, for 365 days. The average collection period (days) is calculated using equation (2-10) in Chapter II.

Table XVIII shows the average percent of account sales paid in each payment interval and the average collection period for dealers with various firm characteristics. The average collection period for all firms having any account sales is 121.02 days. The average collection period is calculated for the dealers' total account sales including sales financed by their suppliers.[6] The average percent of account sales not paid for is only .33 percent. However, only 19 of the 87 dealers reported any bad debts. If the dealers were reluctant to report bad debts, the average percent of account sales not paid for may be

TABLE XVIII

AVERAGE PERCENT OF ACCOUNT SALES PAID IN ALTERNATIVE PAYMENT PERIODS AND THE AVERAGE COLLECTION PERIOD ACCORDING TO FIRM CHARACTERISTICS, 87 DEALERS

Firm Characteristic	Average Percent of Account Sales Paid In Alternative Payment Intervals (Days)						Average Collection Period (Days)
	≤ 30	31-90	91-180	181-365	> 365	Not Paid	
All Firms With Accounts (87)[a]	27.68	23.24	25.88	21.94	.93	.33	121.02
Type of Firm							
Cooperative (37)	39.38	32.78	20.84	6.54	.41	.05	78.95
Independent Dealers (40)	17.79	14.53	29.20	36.45	1.46	.57	159.30
Company Store (10)	24.00	22.80	31.20	20.90	.70	.41	123.48
Fertilizer Sales							
≤ $50,000 (10)	29.00	15.50	39.00	15.00	1.00	.50	116.63
$51,000-150,000 (33)	23.86	26.42	25.33	23.41	.61	.36	130.78
$151,000-250,000 (22)	37.09	22.41	21.50	18.07	.79	.15	105.82
> $250,000 (18)	23.06	24.00	22.90	22.17	1.39	.39	126.82

[a]Numbers in parentheses are the number of firms in each category.

small compared to the actual situation. The average percent of account sales paid for within 30 days of the purchase date is 27.7 percent.[7]

As shown in Table XVIII, the cooperatives have a larger average percent of account sales paid in the early payment intervals (30 and 31-90 days) and a shorter collection period than either company stores or independent dealers. The cooperatives have an average collection period per firm equal to approximately 79 days compared to 123.5 for company stores and 159.3 days for independent dealers. Recall, from Table XIII, that a larger proportion of the cooperatives have shorter account due periods and finance charge periods than either independent dealers or company stores.[8] The independent dealers have a larger average percent of account sales paid in the intervals after 180 days and a larger percent not paid than either company stores or cooperatives. The average percent of account sales not paid is .57 percent for independents compared to .05 for cooperatives and .41 for company stores.

The percent of account sales paid in alternative payment intervals and the average collection periods are also shown for dealers in each fertilizer sales group. Based on the average collection period, calculated for each size group, there does not appear to be a significant relationship between the size of the fertilizer sales and the length of the average collection period.

Table XIX shows the average percent of account sales paid in each payment interval and the average collection period for dealers using alternative account instruments and account policies. The dealers using the account instrument to finance all of their credit sales have a longer average collection period than the dealers having both accounts and notes. The average collection period for the dealers with only

TABLE XIX

AVERAGE PERCENT OF ACCOUNT SALES PAID IN ALTERNATIVE PAYMENT PERIODS AND THE AVERAGE COLLECTION PERIOD ACCORDING TO THE TYPE OF ACCOUNT POLICY USED, 87 DEALERS

Account Arrangement	Number of Dealers	Average Percent of Account Sales Paid in Alternative Payment Intervals (days)						Average Collection Period (days)
		≤30	31-90	91-180	181-365	>365	Not Paid	
All Account Firms	87	27.68	23.24	25.88	21.94	.93	.33	**121.02**
Instrument								
Account Only	57	28.18	20.91	24.15	24.98	1.38	.39	**127.51**
Account-Note	30	26.73	27.67	29.16	16.15	.07	.22	**108.65**
Account Policy								
Account Due Period	12	35.83	24.08	9.92	30.00	.00	.17	**120.21**
Account Due Period Finance Charge	41	30.27	25.41	23.32	19.51	1.07	.41	**113.89**
Account Due Period Cash Discount	8	19.06	10.12	40.63	29.75	.28	.16	**148.57**
Account Due Period Finance Charge-Cash Discount	26	22.50	23.46	32.75	19.63	1.32	.34	**124.10**

accounts is 127.5 days compared to 108.6 days for the dealers with both accounts and notes.[9] The dealers with notes have a smaller average percent of account sales paid in the intervals after 180 days and a smaller percent not paid than the dealers with only accounts.

The lower portion of Table XIX shows the variation in the percent of account sales paid in each payment interval and the average collection period among the dealers with alternative account policies. The dealers imposing a finance charge and no cash discount have the shortest average collection period per firm (113.9 days). The dealers with both finance charges and cash discounts have account sales outstanding for 124.1 days. However, the dealers with neither a finance charge nor a cash discount have an average collection period per firm of only 120.2 days. Also, the dealers with a cash discount but imposing no finance charge have the longest average collection period (148.6 days).

The length of the account due period is not considered in Table XIX. The length of the account due periods for dealers with each of the account policies is likely to influence the length of the average collection period. A large proportion of the dealers imposing a finance charge have account due periods of 30 days or 30 to 90 days (see Table XIII). Also, a large proportion of the dealers offering cash discounts have crop harvest account due periods. Thus, it is evident that in order to determine the effect of the account arrangements on average collection periods, a procedure is needed to distinguish the effects of each credit policy decision variable. This is the purpose of the next chapter.

FOOTNOTES

[1]Oklahoma State Board of Agriculture, Charts and Maps Showing Fertilizer Consumption in Oklahoma, 69-70 (Oklahoma City, 1970), p. 11.

[2]Sidney Siegal, Non-Parametric Statistics for Behavioral Sciences (New York, 1956), pp. 175-179.

[3]Ibid., p. 8.

[4]Ibid., pp. 229-238.

[5]If the dealers which have 100 percent of sales for cash are included, the cooperatives have an average 30.6 percent of their sales for cash compared to 30.0 percent and 20.5 percent for independents and company stores, respectively.

[6]Referring to the percent of account sales paid in each interval as shown in Table XVIII and the approximate age at the time of collection shown above, the average collection period for all firms with accounts is calculated as: .2768(30) + .2324(60) + .2588(135) + .2194(270) + .93(365) + .33(365) = 121.02 days.

[7]Account sales do not include sales paid for in cash on the date of purchase.

[8]A statistical analysis of the effect of the credit decision variables on the average collection period is discussed in Chapter IV.

[9]The dealers with both accounts and notes have approximately 22.5 percent of their fertilizer sales on notes (Table XVII) which are outstanding for an average of 6 months (180 days).

CHAPTER IV

CREDIT PERFORMANCE FOR ALTERNATIVE CREDIT POLICIES

In Chapter II, it was hypothesized that the dealer's receivable investment cost is a function of the proportion of fertilizer sales financed with either accounts or notes and the timing of payments for financed sales. The average collection period is used as a measure of the timing of payments for credit sales. The average collection period on notes receivable is assumed to be equal to the length of the note payment period specified on the note instrument. The average collection period on accounts receivable and the proportion of fertilizer sales on accounts and on notes are hypothesized to be a function of the credit policy decision variables. Thus, in order to calculate the cost of investing a dealer's funds in receivables for alternative credit arrangements, the empirical relationship existing between these credit performance variables and the credit policy decision variables must be estimated.

In Chapter III, the data regarding the dealers' firm characteristics, credit arrangements, and credit performance were presented. Using the data, a multiple linear regression analysis will be utilized to estimate the change in the values of the credit performance variables when a dealer changes a decision variable in his credit arrangement. Using the regression equations estimated for average collection period, percent accounts, and percent notes, the cost of investing a dealer's

funds in receivables under alternative credit arrangements can then be calculated.

Statistical Procedure

Multiple Linear Regression Models

The multiple linear regression procedure is used to estimate the linear relationship which exists between a dependent variable denoted by Y and k independent or explanatory variables denoted by X_1, X_2, ..., X_k. It is assumed that a linear relationship exists between Y and the X's for each observation in a sample of size n such that:

$$Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots \beta_k X_{ki} + \nu_i \qquad (4\text{-}1)$$

where:

$i = 1, 2, \ldots, n$ observations,

Y_i = ith observation on the dependent variable,

$\beta_o, \beta_1, \beta_2, \ldots, \beta_k$ = unknown constants,

$X_{1i}, X_{2i}, \ldots, X_{ki}$ = ith observation on the k independent variables, and

ν_i = unknown error or disturbance terms.

Utilizing the sample data, the β coefficients and the parameters of the distribution of the error terms (mean and variance) are estimated by the method of least squares. When the following assumptions about the observations are met the ordinary least squares procedure provides the best (least variance), unbiased, linear estimators of the β coefficients.[1]

1. The ν_i (error terms) are random variables and their expected value is equal to zero.

2. The ν_i (error terms) have a constant variance σ^2 for all sets of values of the independent variables X and the ν_i are not correlated with one another.
3. The numbers $X_{1i}, X_{2i}, \ldots, X_{ki}$ are fixed and not subject to random variation.
4. The number of parameters to be estimated (k) is less than the number of observations (n) and no exact linear relationships exist among any of the X variables.[2]

The least squares procedure used to estimate the β coefficients gives the estimated regression equation:

$$\hat{Y}_i = b_o + b_1X_{1i} + b_2X_{2i}, \ldots, b_kX_{ki} \qquad (4\text{-}2)$$

where:

$\hat{Y}_i$ is the estimate of Y_i for the ith observed values of the X's and $b_o, b_1, \ldots, b_k$ are the estimates of $\beta_1, \beta_2, \ldots, \beta_k$.

Then, the observed value for the ith Y is:

$$Y_i = b_o + b_1X_{1i} + b_2X_{2i} + \ldots, b_kX_{ki} + e_i \qquad (4\text{-}3)$$

where:

$e_i = Y_i - \hat{Y}_i$ are the residuals.

The dependent or response variables for which regression equations are estimated in this study are:

$Y_1 = (M_a)$ average collection period for accounts receivable,

$Y_2 = (x_a)$ percent of fertilizer sales on account,

$Y_3 = (x_n)$ percent of fertilizer sales on notes, and

$Y_4 = (y_c)$ percent of fertilizer sales for cash.

The average collection period model (Y_1) is estimated using data from 87 dealers (observations from the 87 firms with accounts). The account and cash models (Y_2, and Y_4) are estimated with data from the 89 dealers who offer financing (either accounts and/or notes). The note model is estimated with data from 32 dealers who offer note financing. Table XX shows the mean, standard deviation, and range for the observed values of each dependent variable. The observed average collection period on accounts is computed for each of the 87 dealers as described in Chapter II (equation 2-10) using the payment distribution for all account sales including those sales written off as bad debts. The observations for the percent of fertilizer sales paid in cash (on the purchase date) and sold on accounts or notes are obtained directly from the questionnaire completed by each dealer. The percent of sales on accounts and on notes include both the dealer's and his suppliers' accounts and notes.[3]

Several models were estimated and evaluated for each dependent variable. All models are multiple linear regression models of the form specified in equation (4-2). The independent variables selected to estimate the regression equations for Y_1, Y_2, Y_3 and Y_4 are either credit policy variables which can be controlled by the dealer or firm characteristics which can be measured. The hypothesized effect of the credit policy variables upon each dependent variable was discussed in Chapter II. No explanatory variables concerning the buyers' behavior or environment were observed. The explanatory variables considered and their respective explanations are:[4]

X_1 = Finance charge period if a finance charge is imposed on late payments, account due period otherwise (days),[5]

X_2 = Cash discount rate offered for early payments (%),

X_3 = Cash discount period (days),

X_4 = Finance charge rate per month imposed on accounts not paid by the finance charge period (%),

X_5 = Annual interest rate charged on notes (%),

X_6 = Note payment period or average collection period on notes (months),

X_7 = 1 if cash discount is offered, 0 otherwise,

X_8 = 1 if finance charge is imposed on past due accounts, 0 otherwise,

X_9 = 1 if dealer uses note financing, 0 otherwise,

X_{10} = annual fertilizer sales (1000 dollars),

X_{11} = 1 if dealer is a cooperative, 0 otherwise, and

X_{12} = 1 if dealer is an independent dealer, 0 otherwise.

TABLE XX

MEANS, STANDARD DEVIATIONS, AND RANGES FOR THE OBSERVED VALUES OF THE DEPENDENT VARIABLES[a]

Parameter	Variable	Unit	Mean	Standard Deviation	Range
Y_1	Average Collection Period	days	121.05	71.49	31.5-279.5
Y_2	Percent of Fertilizer Sales on Accounts	%	65.04	26.24	0-100
Y_3	Percent of Fertilizer Sales on Notes	%	23.47	21.04	1-85
Y_4	Percent of Fertilizer Sales for Cash	%	25.29	23.16	0-90

[a]Statistics are computed for the average collection period from 87 dealers, percent account and percent cash from 89 dealers and percent note from 32 dealers.

Variables X_1 through X_9 are account and note credit policy decision variables which make up a credit arrangement. Variables X_1 through X_6 are the conventional quantitative variables and X_7 through X_9 are (0,1) dummy variables. Variables X_{10} through X_{12} are variables representing firm characteristics. The annual fertilizer sales variable in 1,000 dollar units, (X_{10}) is included as a potential independent variable in order to determine if the size of the firm has a significant impact upon the dealers' credit performance variables. Variables X_{11} and X_{12} are dummy variables used to classify the dealers according to type of firm. The dummy variable for the third type of firm, company stores, is deleted to avoid singularity.[6, 7] Likewise, dummy variables are not included for dealers who do not have cash discounts, finance charges or notes.

There are several ways to utilize dummy variables in a regression analysis.[8, 9] The (0,1) dummy variables listed as potential independent variables allow for intercept changes only. For example, consider dummy variable X_7. If a regression equation is estimated including a (0,1) dummy variable for a cash discount (X_7), two parallel linear functions are estimated, one for dealers with cash discounts and one for dealers without cash discounts.[10] Sappington[11] indicates that a (0,1) dummy variable to allow for intercept changes should be used only if the assertion that the slopes are equal can be justified.[12]

The means, standard deviations, and ranges of the independent variables calculated from the data for 89 dealers are shown in Table XXI. The means for the dummy variables X_7, X_8, and X_9 are the proportion of the sample dealers having the credit policy variable and the means for the variables X_{11} and X_{12} are the proportion of the 89 dealers which are

TABLE XXI

MEANS, STANDARD DEVIATIONS, AND RANGES FOR THE OBSERVED VALUES OF THE INDEPENDENT VARIABLES, (FOR 89 DEALERS AND FOR DEALERS HAVING THE VARIABLE)

Variable	Parameter	Unit	For 89 Dealers			For Dealers Having the Variable			
			Mean	Standard Deviation	Range	Number of Dealers	Mean	Range	Standard Deviation
Account Due Period or Finance Charge Period	X_1	days	87.19	61.45	0-180	87	89.20	30-180	60.69
Cash Discount Rate	X_2	%	.98	1.29	0-5	36	2.42	2-5	.77
Cash Discount Period	X_3	days	9.44	14.64	0-60	36	23.33	0-60	14.34
Finance Charge Rate	X_4	%/mo.	.84	.53	0-1.5	67	1.12	.5-1.5	.25
Interest Rate	X_5	%/yr.	3.01	4.44	0-12	32	8.38	0-12	3.11
Note Payment Period	X_6	months	2.22	3.18	0-10	32	6.19	3-10	1.86
Cash Discount[a]	X_7	(0,1)	.40	.49	(0,1)	36	1	1	--
Finance Charge[a]	X_8	(0,1)	.75	.43	(0,1)	67	1	1	--
Notes[a]	X_9	(0,1)	.36	.48	(0,1)	32	1	1	--
Fertilizer Sales	X_{10}	$1,000	170.25	110.18	15.31-486.6	89	110.18	15.31-486.6	110.18
Cooperative[a]	X_{11}	(0,1)	.44	.50	(0,1)	39	1	1	--
Independent Dealer[a]	X_{12}	(0,1)	.45	.50	(0,1)	40	1	1	--

[a]Dummy variable.

either cooperatives or independent dealers. Not all firms have each of the credit policy variables included in their credit arrangement. The means, standard deviations and ranges are also shown only for those firms having each variable.

Selection Among Alternative Models

A computer multiple regression routine using the forward selection procedure was used to estimate alternative regression equations for each of the credit performance variables. The forward selection procedure is described by Draper and Smith.[13] The first linear regression equation estimated using this procedure includes only the independent variable most highly correlated with the dependent variable. Additional equations are derived by inserting additional variables one at a time in the order determined by the magnitude of their partial correlation coefficients. The partial correlation coefficient is a measure of the importance of variables not yet in the equation. The process is continued until all the specified independent variables are included in the regression equation or, if specified, until the partial F-test value for the most recently inserted variable becomes nonsignificant at a specified probability level. The partial F-test is used to test whether or not adding a new term to the model explains a significant amount of the variation in addition to that explained by the terms previously in the equation.

A criticism of the forward selection procedure is that the contribution of the variables already in the equation is not re-examined with a partial F-test after an additional variable is added. The introduction of a new variable to the model may have an effect on the importance

of a variable which entered at an earlier stage.[14] In order to avoid this problem, a significance level for acceptance of new variables into the model is not specified. This forces the program to accept all specified independent variables. The partial F-tests for all variables in each model generated by the forward selection procedure are then examined.

In addition to the partial F-tests, other statistical values such as the square of the multiple correlation coefficient (R^2), the standard error of the estimate (s) and the standard error of the b coefficients, are compared for alternative models. Also, the residuals are examined to check for violations in the assumptions of the least squares regression analysis and for inadequacies in the model. A discussion concerning the computation and application of these criteria is presented in Draper and Smith.[15]

The selection of a specific regression equation among the alternatives available is based on the objectives of the analysis. The primary objective of the regression analysis is to determine the importance of the credit policy variables as a part of the dealer's overall credit arrangement in explaining each of the selected credit performance variables. Therefore, two criteria were used in evaluating the equations: (1) do the signs of the estimated regression coefficients tend to support or reject the hypothesized effect and (2) is the magnitude of the regression coefficient large enough relative to its standard error to support the hypothesis that the b coefficients are significantly different from zero? Only independent variables with b coefficients significant at the .20 level of probability or less were included in each of selected models.[16]

A secondary objective of the regression analysis is to estimate functions which are useful in predicting how changes in the dealer's credit arrangement cause changes in the average collection period on accounts and the percent of fertilizer sales financed with notes and accounts. Considering this objective, the adequacy of the model and the precision and accuracy of the estimates are evaluated with criteria such as R^2, the overall F-test value, and an examination of the residuals.

Empirical Results

Average Collection Period Model

The regression model selected to estimate the average collection period (M_a) consists of five independent variables. The estimated regression equation is:

$$\begin{aligned} M_a = \hat{Y}_1 &= 65.0639 + .7230\ X_1 - 58.9239\ X_4 \\ &\qquad (19.0311)^a (.1219)^a \quad (28.8120)^b \\ &\quad - 28.4612\ X_7 + 78.4168\ X_8 - 20.7516\ X_9 \\ &\qquad (14.4090)^b \quad (35.0600)^b \quad (13.2436)^d \end{aligned} \tag{4-4}$$

where:

The standard errors are given in parenthesis and the significance levels (α) of the coeffients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; and d if $.10 < \alpha \leq .15$.

This selected model has an R^2 of .3726 with an overall F-test value significant at the .0001 probability level (see Table XXII, column 1a). The standard error of the estimate (square root of the residual mean

TABLE XXII

AVERAGE COLLECTION PERIOD REGRESSION MODELS

Independent Variable	Statistic	Model[a] (1a)	(1b)	(1c)	(1d)
Intercept	b_0	65.0639 (19.0311)[a]	66.5507 (19.2369)[a]	56.9952 (18.4830)[a]	89.9513 (18.7075)[a]
Account Due Period	b_1	.7230 (.1219)[a]	.6922 (.1224)[a]	.7274 (.1229)[a]	.6282 (.1151)[a]
Cash Discount Rate	b_2		-8.0468 (5.5806)[d]		
Finance Charge Rate	b_4	-58.9239 (28.8120)[b]	-58.9975 (29.1403)[b]	-54.1429 (28.9031)[c]	
Cash Discount (0,1)	b_7	-28.4612 (14.4090)[b]		-27.7407 (14.5289)[c]	-37.6363 (13.4912)[a]
Finance Charge (0,1)	b_8	78.4168 (35.0600)[b]	75.5299 (35.3765)[b]	73.3937 (35.2216)[b]	18.5822 (14.3336)[e]
Notes (0,1)	b_9	-20.7516 (13.2436)[d]	-20.7334 (13.3932)[d]		
Cooperative (0,1)	b_{11}				-57.7223 (12.8294)[a]
	R^2	.3726	.3589	.3536	.4594
	F	9.62[a]	9.07[a]	11.22[a]	17.42[a]
	s	58.34	58.98	58.86	53.83
	$s/\bar{Y}$	.4819	.4872	.4863	.4447
	D.W.	1.97	2.00	1.94	2.32

[a]The standard errors of the b coefficients are given in parentheses and the significance levels (α) of the coefficients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; d if $.10 < \alpha \leq .15$; e if $.15 < \alpha \leq .20$.

square, s) is 58.34. The standard error of the estimate (s), expressed as a percentage of the mean response $\bar{Y}_1$ (121.05 days) is 48.2 percent. The R^2 value indicates that the credit policy decision variables in the equation explain 37.26 percent of the variation in the dealers' average collection periods. The value for s relative to the mean response $\bar{Y}_1$ indicates that the predictions provided by the model may not be very precise.

The constant term in the equation is statistically significant at the .01 probability level. The coefficients for the independent variables which represent account due period (X_1), finance charge rate (X_4), cash discount (X_7), and finance charge (X_8) are all significant at the .05 probability level. The dummy variable for dealers which offer notes as well as accounts (X_9) is significant at the .12 level.

Based on the partial F-test values and standardized partial regression coefficients,[17] the account due period (X_1)[18] is the most important credit policy variable explaining variation in the dealers' average collection periods on accounts receivable. Its partial regression coefficient (.7230) indicates that on the average a 10 day increase in the dealer's specified account due period would increase the average collection period by 7.230 days given that the other independent variables in the equation are held constant. The positive sign and the magnitude of the coefficient support the hypothesis that the buyer of fertilizer will pay at a later date given a longer interest free period to make the payment.

Since there are dummy variables in the equation (X_7, X_8, X_9), the constant term (b_0 = 65.0639) is the estimated intercept assuming the dealer does not offer cash discounts, impose a finance charge, or offer

note financing. The coefficients for the dummy variables (X_7, X_8, and X_9) are the deviations from the overall intercept (b_0) when the dealer offers a cash discount, imposes a finance charge or offers note financing. The coefficient for the cash discount dummy variable (X_7) indicates that offering a cash discount for early payments decreases the average collection period by 28.4612 days. As discussed in Chapter II, offering a cash discount for early payments may be equivalent to imposing a penalty for late payments. Thus, one would expect the average collection period to be shorter for dealers offering cash discounts.

The coefficient for the note dummy variable (X_9) indicates that dealers who offer note financing in addition to account financing have average collection periods 20.7516 days shorter than dealers offering only account financing. The magnitude and sign of this coefficient substantiates the earlier hypothesis and is consistent with the data presented in Chapter III. It is possible that dealers may issue interest bearing notes to customers who have past-due accounts. Thus, the note may substitute for a finance charge in encouraging farmers to pay at the end of the account due period.

The coefficient for the finance charge dummy variable (X_8) indicates that dealers who impose a finance charge on accounts not paid by the end of the finance charge period have 78.4168 days longer collection periods than dealers who do not impose a finance charge. However, the coefficient for the finance charge rate (X_4) indicates that for the dealers who have finance charges, each .5 percent increase in the finance charge rate decreases the average collection period by 29.4620 days (58.9239 · 5). Thus, based on this equation, only if the dealer's finance charge rate is approximately 1 1/3 percent per month or higher

would the net effect of imposing a finance charge on the average collection period be negative. Approximately 28 percent of the sample dealers with finance charges have finance charge rates greater than 1 1/3 percent.

The coefficient for the finance charge rate (X_4) conforms to the hypothesized relationship. However, the coefficient for the dummy variable for finance charge (X_8) does not support the proposition that imposing a finance charge encourages the customers to pay at an earlier date. One possible explanation for this inconsistency with theory is that some dealers may not be enforcing the finance charge specified in their credit arrangement. Of the 61 dealers imposing a finance charge, 15 indicated that it is imposed before the end of the account due period. For example, one dealer indicated that accounts are due at the time of crop harvest but a finance charge is imposed 30 days after the purchase date. If the finance charge is imposed at an early date but an interest payment is not required unless the account remains unpaid beyond the longer account due period, then the finance charge may not be effective in reducing the dealer's average collection period. Another possible explanation for the coefficient (X_8) being inconsistent with theory is that some dealers who do not have a finance charge may have short collection periods. These dealers may use strict collection procedures or means other than a finance charge to encourage farmers to pay on time. For example, the dealer may not sell more fertilizer to a farmer who has not paid a previous account. If these two factors (enforcement of finance charges and collection practices other than finance charges) were included in the regression equation, the coefficient for the finance charge rate might possibly have a negative sign.

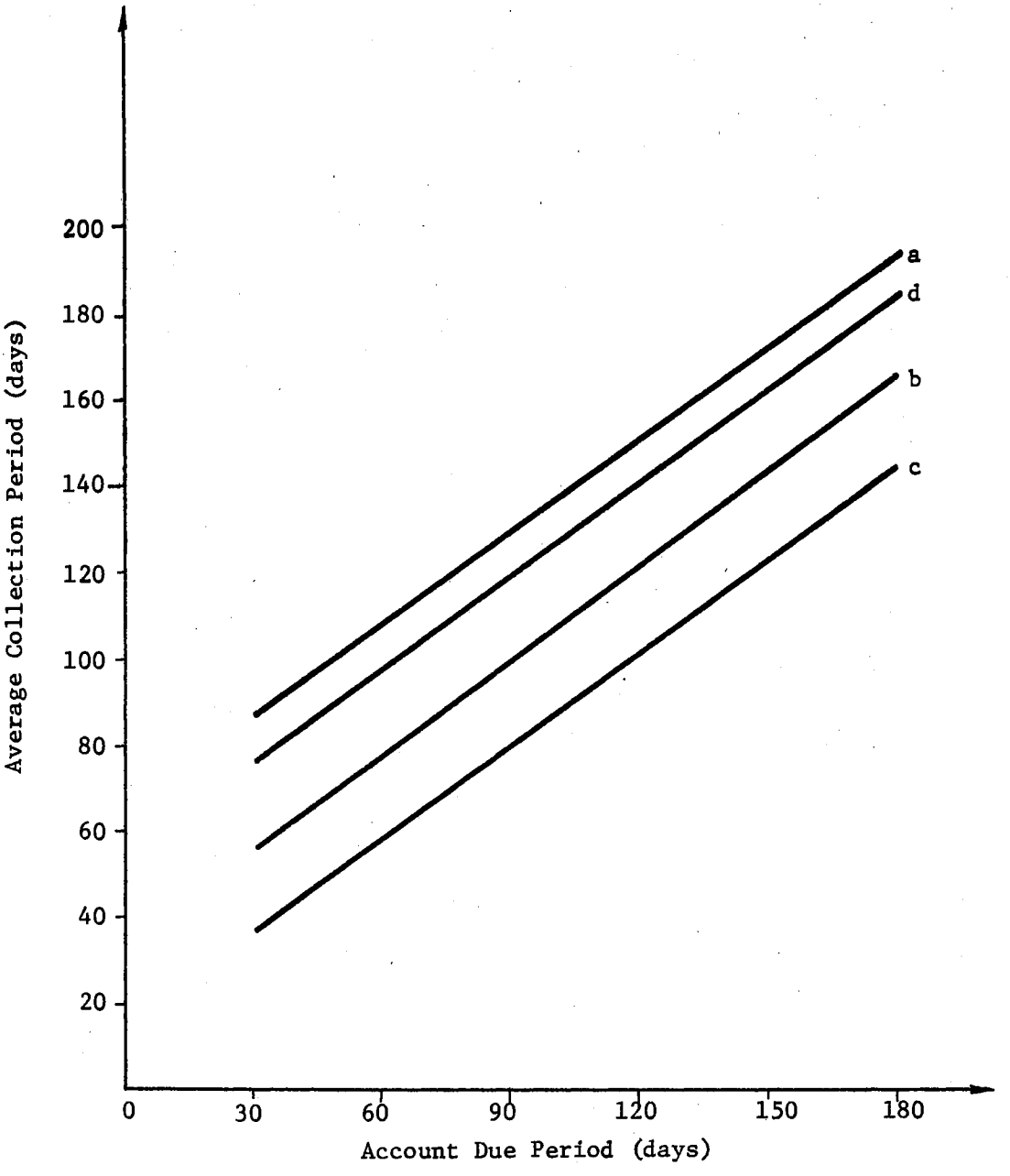
Figure 5 illustrates graphically the estimated collection period functions. The vertical axis measures the estimated average collection period ($\hat{Y}_1$) and the horizontal axis is the dealers account due period (X_1). Since (0,1) dummy variables are used, there are several resulting linear functions. The equations are graphed for only the selected sets of arrangements described below the graph.

To evaluate the validity of the empirical results, the selected equation is compared to alternative estimations. One alternative model included the cash discount rate variable (X_2) rather than the cash discount dummy variable (X_7) (see Table XXII, column 1b). The coefficient for the cash discount rate (X_2) indicates that a one percent higher cash discount rate decreases the average collection period by 8.0468 days.

However, this coefficient is significant at the .15 probability level compared to a significance level of .05 for the cash discount dummy variable in Model 1a. Also, the value for R^2 is smaller and the value for s is larger for Model 1b compared to Model 1a.[19]

If the least significant variable (notes, X_9) in Model 1a is excluded from the equation, the estimated regression equation is Model 1c (Table XXII). Exclusion of (X_9) reduces the R^2 value to .3536 and also reduces the significance of the coefficients of the other independent variables in the equation.

Other credit policy variables such as the cash discount period, the interest rate charged on notes, and the note payment period were deleted from the selected equation. The coefficients for these variables were not significantly different from zero at the .20 probability level when included in the equation with all other independent variables.



a. No Cash Discount or Finance Charge
b. Cash Discount and No Finance Charge
c. Cash Discount and Notes, No Finance Charge
d. Finance Charge Rate Equal to 1.5% Per Month, No Cash Discount, No Notes

Figure 5. Estimated Average Collection Period Functions (Equation 4)

None of the independent variables which represent dealer characteristics are included in the selected collection period equation. The coefficient for the fertilizer sales variable (X_{10}) was not significant at the .20 probability level. When the cooperative dummy variable (X_{11}) is included along with all the variables in equation 1a, the coefficients for the note dummy variable (X_9) and the finance charge rate variable (X_4) are not significant (probability levels are .51 and .23 respectively). Excluding X_4 and X_9 from the equation (Model 1d, Table XXII) results in a higher R^2 value (.4594) and a lower standard error of the estimate (53.83) than for the selected regression model (Model 1a).

The coefficient for the cooperative dummy variable (X_{11}) indicates that cooperative dealers have average collection periods significantly shorter than the other types of firms. An analysis of the data (Chapter III) indicates that a larger proportion of the cooperatives have 30-day account due periods, offer note financing, and impose 1.5 percent finance charge rates compared to other types of firms. Thus, a part of the variation in collection periods explained by the cooperative dummy variable (X_{11}) in Model 1d could be explained by credit policy variables which are less significant when X_{11} is in the equation. Since, the real causal forces for the length of the collection period would appear to be the type of credit arrangement offered by a cooperative rather than the cooperative structure per se, Model 1a is selected over Model 1d.

The deviations between the observed and the predicted average collection period (residuals) also provide information on the validity of the model. The residuals are first examined to determine if the

assumptions about the errors appear to be violated and second to investigate how well the estimated equation predicted the observed average collection periods. A plot of the residuals $(Y_i - \hat{Y}_i)$ against the predicted values $(\hat{Y}_i)$ indicates that the error term assumptions do not appear to be invalidated. The Durbin-Watson d statistic can be used to test the assumption that the successive error terms are serially independent and not autocorrelated. The statistic is calculated from the residuals.[20] For Model 1a, the calculated d statistic is 1.97 (denoted by D. W. in Table XXII) which is greater than the tabulated upper bound for a sample of size 87 and 5 independent variables. Based on this test the hypothesis of random error terms is not rejected and thus, the assumption of independent error terms does not appear to be violated.

A plot of the residuals $(Y_i - \hat{Y}_i)$ against the observed values (Y_i) indicates that the smaller observed values for average collection periods are over predicted and the larger observed values are under predicted. All residuals for observed collection periods less than 70 days are negative and all but one of the residuals for observed collection periods greater than 155 days are positive.

This examination of the residuals suggests that bias may be present in the regression estimates. One possible source of bias is errors of omission.[21] There appear to be independent variables omitted from the equation that affect the timing of payments on account sales. For example, the various collection practices or credit standards a firm includes in its credit policy which are difficult to quantify have not been included in the analysis. Also, unobserved factors which indicate the buyer's financial position of his attitude towards dealer financing are not included in the equations. These and other errors of omission

could bias the partial regression coefficients of the independent variables included in the equation.

Another possible source of bias in the regression estimates are errors of observation or measurement in the independent variables or in both the independent and dependent variables. When errors of measurement in an independent variable are present, there is a dependence between the explanatory variable and the disturbance terms.[22] Thus, the assumption that the X's are a fixed set of numbers may be violated and the ordinary least squares procedures may not give unbiased estimates of the true regression coefficients. If there are errors of observation or measurement present, and the variance of these measurement errors is less than the variance of the true values for X, then ordinary least squares estimates (b) under-estimate the true β values.[23] If a dealer indicated that the customer is charged a fee for accounts paid after a specified number of days, but he does not enforce this action, measurement error would result.

Since a mail questionnaire was used to gather the data, a number of other errors of measurement could possibly exist for both the independent and dependent variables. The dealers' average collection periods were calculated from the distribution of payments for account sales. Errors of measurement would result if in completing the questionnaire, the dealer included cash payments or payments on notes in the payment distribution for account sales. Also, errors of measurement in the cash discount independent variable would exist if dealers reported quantity discounts or lower prices than a competitor as a cash discount for early payments. These errors of measurement and the omission of some independent variables explain part of the bias in the regression

equation shown by the relatively large residuals for the short and long collection periods.

Another problem which must be considered in the evaluation of the results for the average collection period model is the linear relationship which exists between some of the independent variables. If the independent variables are highly correlated with one another, it may be difficult to obtain precise estimates of the net effects of the independent variables.[24] In the selected equation, the finance charge rate variable (X_4) and the finance charge dummy variable (X_8) have a correlation coefficient of .90. However, when both variables are in the equation, both are significant at the .05 level. For predictive purposes, if the intercorrelation of independent variables is expected to continue in the future, the multicollinearity problem may not be serious.[25]

Percent Account Model

The selected regression model for the percent of fertilizer sales on account (x_a) is estimated from data for the 89 dealers who offer sales financing. The estimated function is:

$$\begin{aligned} x_a = \hat{Y}_2 &= 56.7375 + .0637\ X_1 + .5046\ X_3 \\ &\qquad (6.0616)^a (.0454)^e \quad (.2913)^c \\ &\quad - 15.9373\ X_7 - 16.1158\ X_9 + .0601\ X_{10} \\ &\qquad (8.5657)^c \quad (5.4616)^a \quad (.0234)^b \end{aligned} \tag{4-5}$$

where:

The standard errors of the b coefficients are given in parentheses and the significance levels (α) of the

coefficients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; d if $.10 < \alpha \leq .15$; e if $.15 < \alpha \leq .20$.

The model has an R^2 value of .2205 and the F test value is significant at the .001 probability level. The standard error of the estimate (s) is 23.86 (see Table XXIII). The standard error (s) is 36.7 percent of the mean percent of sales on accounts.

The signs of the coefficients for all of the credit decision variables included in the selected equation conform to the hypothesized relationships between the variables and the proportion of fertilizer sales on accounts. The variable most highly correlated with percent of fertilizer sales on account is the note dummy variable (X_9) ($r_{y_2x_9} = .31$). Its partial regression coefficient (significant at the .001 probability level) indicates that dealers who have note financing in addition to account financing have 16.1158 percent fewer sales on accounts given that other independent variables in the equation are held constant.

The coefficient for the dealer's account due period (X_1) is not highly significant (.16 probability level), but its sign substantiates the earlier hypothesis that dealers with longer account due periods have a larger percent of their sales on accounts. Its coefficient (.0637) signifies that a 10 day longer account due period increases the percent of fertilizer sales on account by .637 percent. Thus, given a longer length of time to pay, more farmers may accept the dealer's account financing terms.

The coefficient for the cash discount dummy variable (X_7) is significant at the .08 probability level. Dealers offering cash discounts for early payments have an estimated 15.9373 percent fewer dollar sales

TABLE XXIII

PERCENT ACCOUNT REGRESSION MODELS

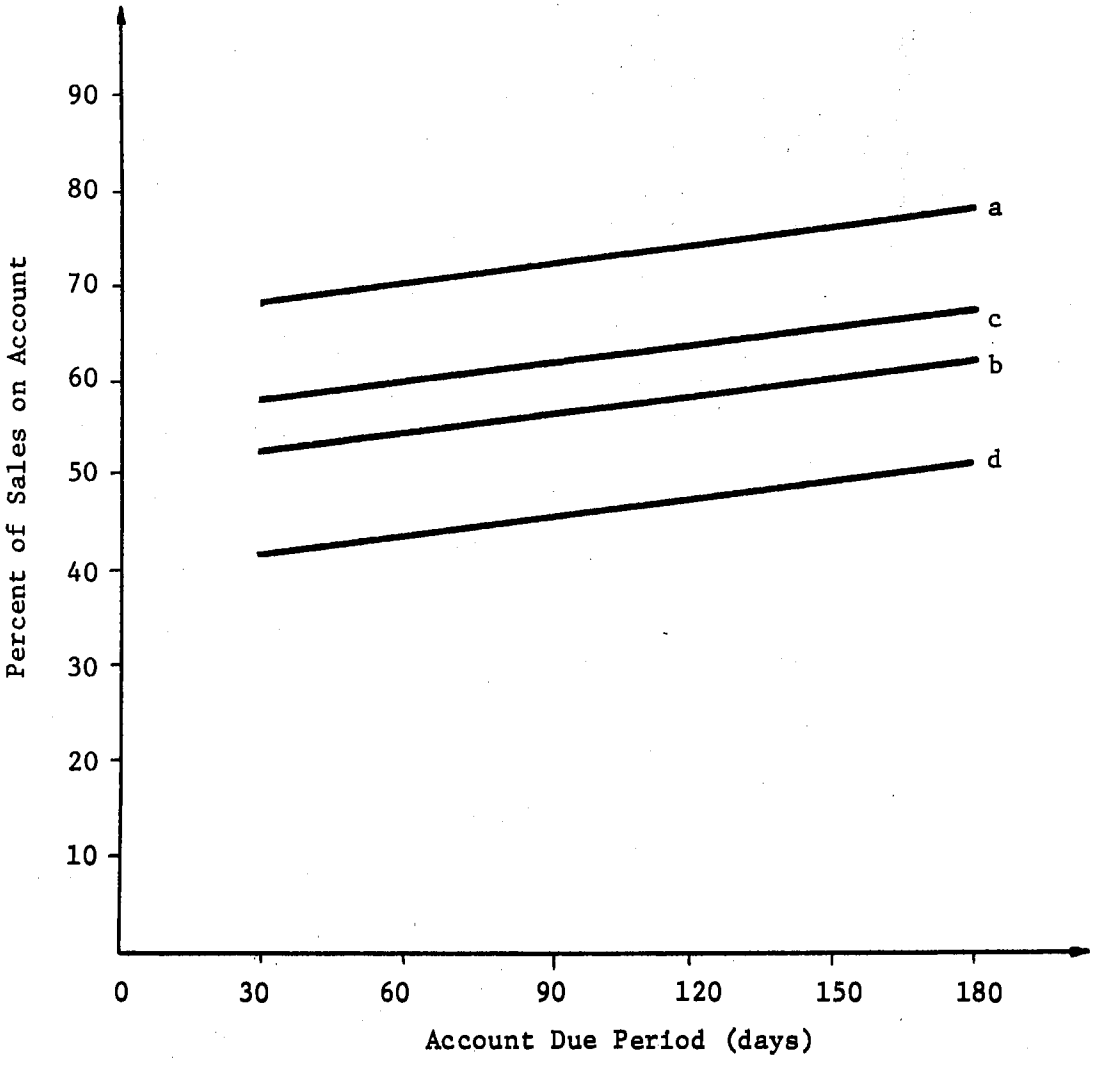
Independent Variable	Statistic	Model[a] (2a)	(2b)	(2c)	(2d)
Intercept	b_0	56.7375 (6.0616)[a]	61.0567 (5.2533)[a]	56.4837 (6.1107)[a]	52.2526 (6.1312)[a]
Account Due Period	b_1	.0637 (.0454)[e]		.0641 (.0461)[e]	.0693 (.0473)[d]
Cash Discount Rate	b_2			-4.0239 (2.8195)[e]	
Cash Discount Period	b_3	.5046 (.2913)[c]	.5591 (.2904)[c]	.3218 (.2495)[e]	.6908 (.2972)[b]
Cash Discount (0,1)	b_7	-15.9373 (8.5657)[c]	-14.1677 (8.5214)[c]		-20.4652 (8.053)[b]
Notes (0,1)	b_9	-16.1158 (5.4616)[a]	-16.4374 (5.4883)[a]	-16.8897 (5.4675)[a]	
Fertilizer Sales/1000	b_{10}	.0601 (.0234)[b]	.0608 (.0235)[b]	.0584 (.0237)[b]	.0500 (.0242)[b]
	R^2	.2205	.2020	.2075	.1388
	F	4.70[a]	5.33[a]	4.35[a]	3.38[b]
	s	23.86	23.99	24.06	24.93
	$s/\overline{Y}$	.367	.369	.370	.383
	D.W.	2.06	2.09	2.07	2.04

[a]The standard errors of the b coefficients are given in parentheses and the significance levels (α) of the coefficients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; d if $.10 < \alpha \leq .15$; e if $.15 < \alpha \leq .20$.

on account. Thus, offering a cash discount encourages more farmers to pay the dealer in cash. However, as evidenced by the coefficient for the cash discount period variable (X_3), the longer the length of time the customer can wait to pay and still be eligible to receive the cash discount, the higher the percent of sales on account. The coefficient is significant at the .06 level and indicates that a day increase in the cash discount period increases the percent of sales on account by .5046 percent. Thus, if a dealer offers a cash discount and the cash discount period is longer than 32 days, the negative effect for the cash discount dummy variable on the percent of sales on account is offset by the positive effect of the longer cash discount period.

A firm characteristic variable, annual fertilizer sales (X_{10}), is also included in the selected equation. An earlier analysis of the average percent of sales on accounts for dealers belonging to alternative size groups (Chapter III, Table XVI) and the correlation coefficient between the dealers' fertilizer sales and percent of sales on account ($r_{y_1x_{10}} = .2211$) suggest that a positive relationship exists. The partial regression coefficient for fertilizer sales (significant at the .011 probability level) indicates that each $1,000 increase in fertilizer sales increases the percent on account by .0601 percent. Thus, the larger fertilizer dealers tend to have a larger percent of their sales on account.

Figure 6 shows the estimated percent of sales on account ($\hat{Y}_2$) for a dealer having $170,000 annual fertilizer sales assuming alternative credit arrangements. The horizontal axis measures the independent variable, account due period (X_1).



a. No Cash Discount or Notes
b. No Cash Discount, but Offer Note Financing
c. Cash Discount with Period Equal to 10 Days, No Notes
d. Cash Discount with Period Equal to 10 Days and Offer Note Financing

Figure 6. Estimated Functions for the Percent of Fertilizer Sales on Accounts ($170,000 Fertilizer Sales, Equation 5)

Table XXIII shows a comparison of the selected model (Model 2a) to three alternative models. Model 2b excludes the least significant independent variable in Model 2a, account due period (X_1). The other regression coefficients and their standard errors do not change substantially when this variable is not in the equation. However, deleting this variable reduces the R^2 value and increases the standard error of the estimate.

In Model 2c the cash discount dummy variable (X_7) in Model 2a is replaced with the cash discount rate variable (X_2). The coefficient for cash discount rate indicates that a one percent increase in the rate reduces the percent of sales on account by 4.0239 percent. However, when this variable is added to the equation, the coefficient and the significance of the cash discount period variable (X_3) decreases. This alternative model has a lower R^2 value and a higher standard error of the estimate (s) than Model 2a.

The final model presented (2d) illustrates the contribution of the note dummy variable (X_9) in explaining the variation in the percent of sales on accounts. The note dummy variable is deleted in Model 2d. By deleting this significant variable, the R^2 for the fitted equation is decreased substantially compared to Model 2a (from .2205 to .1388). When the note dummy variable is deleted, the cash discount variables (X_3 and X_7) and the account due period variable (X_1) are more significant. However, an examination of the residuals for both equations suggests that Model 2a predicts the small and large observed percent of sales on account with more accuracy than Model 2d.

Several other models which included different independent variables were estimated. The coefficients for the finance charge variables (X_4

and X_8) were not significantly different from zero (probability level was greater than .40) when added to Model 2a. The coefficients for the dummy variables representing the type of firm (X_{11} and X_{12}) were also not significant at the .40 probability level when included in Model 2a.

An examination of the residuals plotted against the predictions for the selected Model (2a) indicates no unusual behavior. Also, the Durbin-Watson d statistic suggests that the error terms are not serially correlated. However, a plot of the residuals against the observed percent on account for each dealer shows a positive linear trend. The smaller percents on account appear to be over predicted and the larger percents on account under predicted. As suggested in the evaluation of the average collection period model, this residual plot and the low R^2 value suggest that the estimates provided by the fitted equation may be biased. The omission of variables that were unobserved may introduce bias into the regression coefficients estimated by the least squares procedure. Additional bias may be introduced due to errors of measurement and observation in the variables. Errors of measurement in the dependent variable are present if some dealers included accounts paid in 10 to 20 days after the purchase date as cash rather than account sales. This error in the measurement of the dependent variable (Y) can be treated as ordinary error if there is no error in the measurement of the X's and the errors of measurement for Y are uncorrelated.[26] However, errors in the observation of independent variables may result in biased partial regression coefficients. For example, if dealers offer free financing for longer periods of time than specified by their finance charge period, the true regression coefficient for X_1 may be under-estimated.

Percent Note Model

The regression model for the percent of fertilizer sales on notes (x_n) is estimated with two independent variables utilizing data from 32 dealers that offer note financing. All but two of these dealers also offer account financing. The estimated function is:

$$x_n = \hat{Y}_3 = \underset{(13.5422)^c(1.050)^a}{26.0509 - 3.2426\ X_5} + \underset{(1.7562)^b}{3.9717\ X_6} \qquad (4\text{-}6)$$

where:

> The standard errors of the b coefficient are given in parentheses and the significance levels (α) of the coefficients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$.

The model has an R^2 value of .3129 and an F value of 6.604 which is significant at the .005 probability level. The standard error of the estimate is 18.03. The standard error of the estimate expressed as a percentage of the mean percent of sales on notes is 76.8 percent.

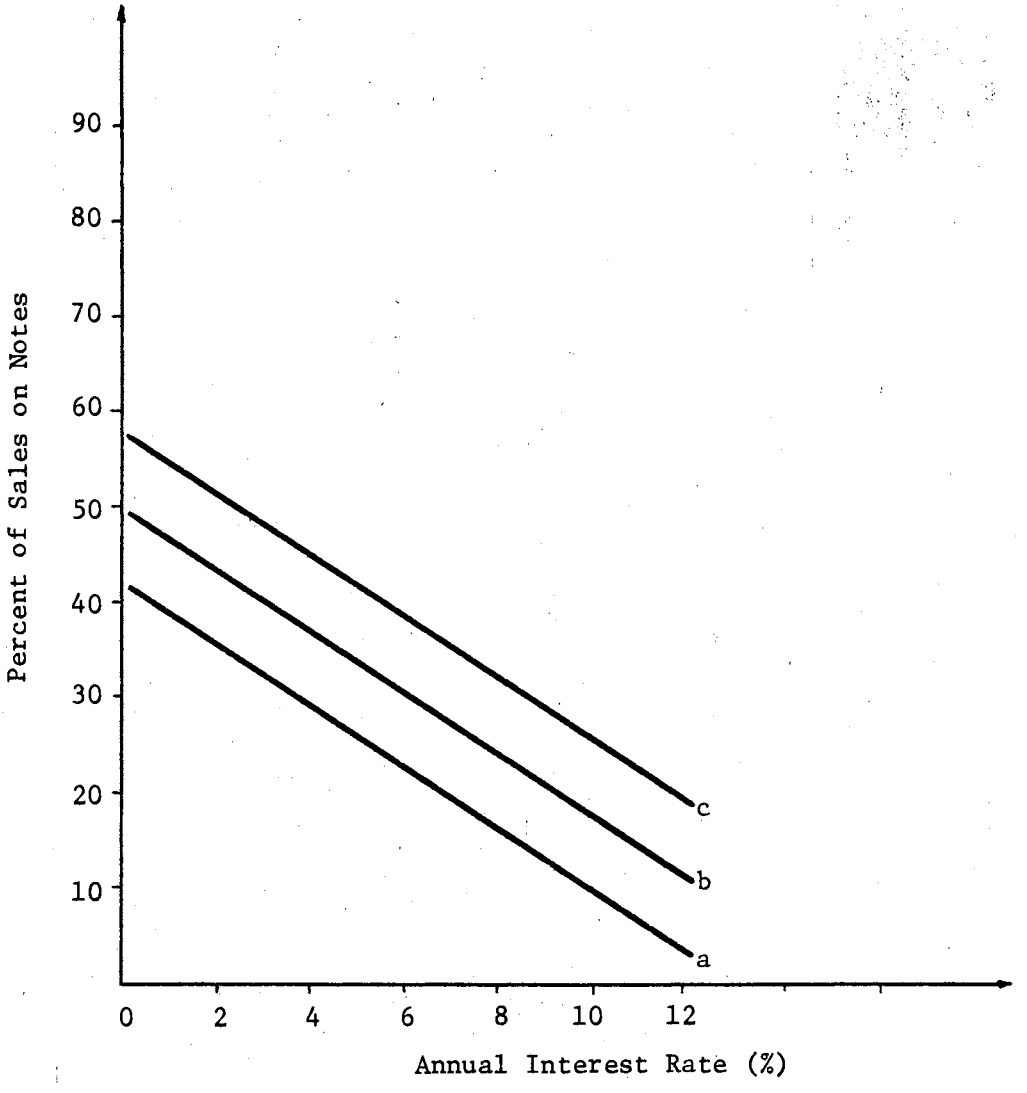
The intercept coefficient indicates that dealers which offer note financing have 26.0509 percent of their fertilizer sales on notes given that the note payment period (X_6) and the annual interest rate (X_5) are fixed at zero. The coefficient for the intercept constant is significant at the .06 probability level. The magnitude of the intercept constant is consistent with the earlier calculation of the average percent of sales on notes for dealers who offer note financing (Chapter III, Table XVII).

Based on the partial F test values and the standardized regression coefficients for equation (4-6), the annual interest rate variable (X_5) is the most important independent variable. The coefficient for X_5 is

significant at the .005 probability level and substantiates the hypothesis that a higher interest rate charged on notes reduces the willingness of buyers to use the dealer's note financing. A one percent higher interest rate results in an estimated 3.2426 percent decrease in the percent of sales on notes. The coefficient for the note payment period (X_6) also supports the earlier hypothesis. Thus, a one month longer average note payment period increases the percent of sales financed with notes by 3.9717 percent. This coefficient is significantly different from zero at the .03 probability level. Figure 7 summarizes the estimated percent of sales financed with notes for alternative annual interest rate charges assuming a four month, a six month, and an eight month average note payment period.

An alternative model using data from all dealers which offered either account or note financing (89 dealers) was also estimated. This model, which included a (0,1) dummy variable for dealers who offer note financing (X_9), resulted in the same estimated partial regression coefficients as for the selected model. The coefficient for the note dummy variable was identical to the intercept constant in equation (4-6). The intercept constant for the second model was estimated to be zero. Thus, the resulting predictions would be identical to those for the selected model. However, due to the increased number of observations (89 compared to 32) the R^2 value is higher and the standard error of the estimate and the standard errors for the b coefficients are lower with this second model.

Other models estimated included additional credit policy variables and variables representing firm characteristics. Given that the interest rate (X_5) and the note payment period (X_6) variables are in the



a. 4 Month Note Payment Period
b. 6 Month Note Payment Period
c. 8 Month Note Payment Period

Figure 7. Estimated Functions for the Percent of Fertilizer Sales on Notes (Equation 6)

equation, the coefficients for these other independent variables were not significant at the .20 probability level.

A plot of the residuals $(Y_i - \hat{Y}_i)$ against the predicted percent on notes for equation (4-6) suggests that some abnormality may be present.[27] The magnitude of the residuals appear to increase at higher predicted values. The residual plot suggests that the assumption that the error terms have a constant variance independent of the value of X_{5i} and X_{6i} may be violated.[28] When the variance is not constant or heteroscedasticity exists, the estimates obtained with ordinary least squares analysis will be unbiased but will not have the minimum variance. A suggested correction for this problem is to transform the observations of the dependent variable and then apply the ordinary least squares analysis to the transformed variables. The appropriate type of transformation depends upon the form of heteroscedasticity.[29]

An examination of the residuals plotted against the observed values for percent on notes indicates that all observed values greater than 50 percent are under predicted. Additional independent variables may need to be added to the model to better predict the percent on notes for high observed values. Bias in the estimates may also be due to errors in measurement of the independent variables in the equation. For example, some dealers who specified that interest is charged on notes may not be actually collecting interest if the note is paid by a specified date.

Percent Cash Model

The selected models for the average collection period, percent on account, and percent on note will be used to estimate the cost of

investing funds in receivables. The percent cash model will not be used in the cost calculation, but a regression analysis is performed to determine which credit policy variables and/or firm characteristics are significant in explaining variation in the percent of fertilizer sales for cash. The selected regression model for the percent of fertilizer sales for cash (y_c) is estimated with data from the 89 dealers that sell on credit. The estimated function is:

$$\begin{aligned} y_c = \hat{Y}_4 = 41.4608 &- .0543\ X_1 - .5354\ X_3 \\ &(5.4868)^a (.0411)^e \quad (.2637)^b \\ &+ 16.6152\ X_7 - 8.9184\ X_9 - .0581\ X_{10} \\ &(7.7536)^b \quad (4.9437)^c \quad (.0212)^a \end{aligned} \tag{4-7}$$

where:

> The standard errors of the b coefficients are in parentheses and the significance levels (α) are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; d if $.10 < \alpha \leq .15$; e if $.15 < \alpha \leq .20$.

The model has an R^2 value of .1800 and an overall F-value significant at the .005 level (see Table XXIV, Model 4a). The standard error of the estimate (s) is 21.59. The standard error of the estimate expressed as a percentage of the mean response is 85.4 percent. The R^2 and s values tend to indicate that predictions with this model would be neither extremely accurate or precise.

However, selected credit policy variables do explain some of the variation among dealers in the percent of fertilizer sales for cash. All of the coefficients for the independent variables are consistent with the hypothesized effect. The intercept coefficient of 41.4607

TABLE XXIV

PERCENT CASH REGRESSION MODELS

Independent Variable	Statistic	Model[a] (4a)	(4b)	(4c)
Intercept	b_0	41.4608 (5.4868)[a]	37.7753 (4.7490)[a]	41.1392 (5.5892)[a]
Account Due Period	b_1	-.0543 (.0411)[e]		-.0567 (.0416)[e]
Cash Discount Period	b_3	-.5354 (.2637)[b]	-.5819 (.2625)[b]	-.5252 (.2685)[c]
Note Payment Period	b_6			-1.0368 (.7669)[e]
Cash Discount (0,1)	b_7	16.6152 (7.7536)[b]	15.1053 (7.7034)[c]	16.1928 (7.8448)[b]
Note (0,1)	b_9	-8.9184 (4.9437)[c]	-8.6440 (4.9614)[c]	
Fertilizer Sales/1000	b_{10}	-.0581 (.0212)[a]	-.0587 (.0213)[a]	-.0599 (.0213)[a]
	R^2	.1800	.1627	.1662
	F	3.64[a]	4.08[a]	3.31[a]
	s	21.59	21.69	21.78
	$s/\overline{Y}$	.855	.858	.861
	D.W.	2.17	2.21	2.16

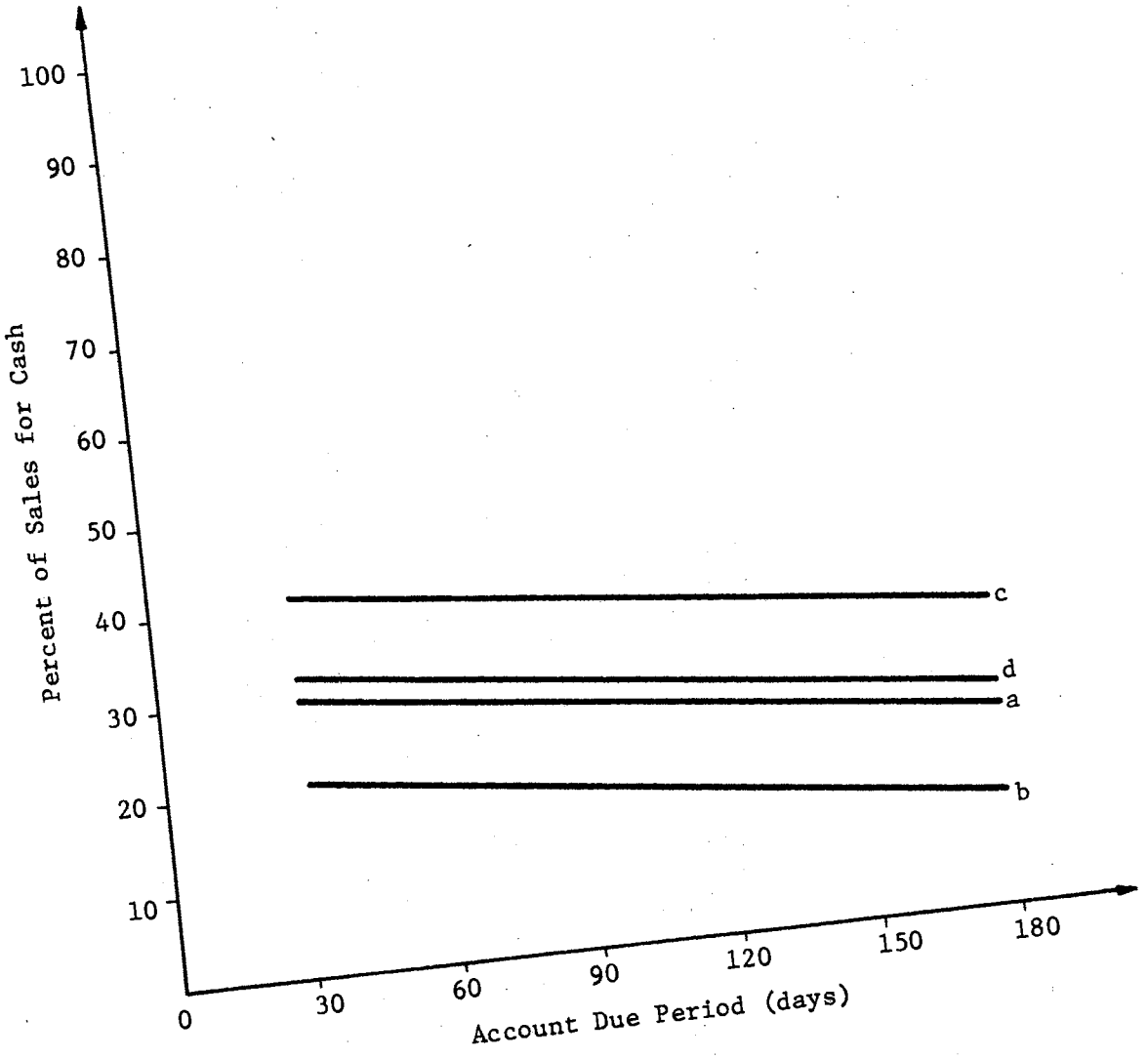
[a]The standard errors of the b coefficients are given in parentheses and the significance levels (α) of the coefficients are denoted by: a if $\alpha \leq .01$; b if $.01 < \alpha \leq .05$; c if $.05 < \alpha \leq .10$; d if $.10 < \alpha \leq .15$; e if $.15 < \alpha \leq .20$.

is significant at the .001 probability level. As indicated by the coefficient for the cash discount dummy variable (X_7), dealers that offer a cash discount have an estimated 16.6152 percent larger percent of sales for cash given that the cash discount period is the purchase date (zero days). However, for each one day increase in the cash discount period (X_3) the percent of sales for cash decreases by .5354 percent. If the cash discount period is longer than 31 days beyond the purchase date, the positive effect of offering a cash discount upon percent cash is offset by the negative effect of the longer cash discount period.

If the dealer offers note financing (X_9), in addition to account financing, the percent of sales for cash is decreased by 8.9184 percent. The coefficient for the note dummy variable is significant at the .07 probability level. As indicated by the coefficient for the account due period (X_1) a 10 day longer length of time for the buyer to pay his account purchases results in an estimated .543 percent decrease in the percent of sales for cash. This coefficient is less significant than the other variables (.19 probability level).

The coefficient for the fertilizer sales variable (X_{10}) suggests that larger firms have a smaller percent of their sales for cash than smaller firms. Each 1,000 dollar increase in fertilizer sales reduces the percent cash by .0581 percent. The coefficient for X_{10} is significant at the .007 probability level, and substantiates the analysis of data presented in Chapter III (Table XVI).

Figure 8 summarizes the effect of the credit policy decision variables on the percent of sales for cash ($\hat{Y}_4$). The estimated percent cash is shown for alternative account due periods assuming selected



a. No Cash Discount, No Notes
b. No Cash Discount, but Offer Note Financing
c. Cash Discount with Cash Discount Period Equal to 10 Days, No Notes
d. Cash Discount with Period Equal to 10 Days and Offer Note Financing

Figure 8. Estimated Functions for the Percent of Fertilizer Sales for Cash ($170,000 Fertilizer Sales, Equation 7)

cash discount and note policies. The annual fertilizer sales is assumed to be $170,000.

Table XXIV shows two alternative models for percent cash. In Model 4b, the least significant variable of Model 4a, account due period (X_1), is deleted. This variable is correlated with the cash discount dummy variable (X_7) and the cash discount period variable (X_3) ($r_{x_1x_7}$ = .38, $r_{x_1x_3}$ = .39). Thus, elimination of X_1 changes the coefficients and reduces the level of significance for X_3 and X_7. The R^2 value is lower and the s value higher for equation 4b compared to 4a. In Model 4c, the note dummy variable (X_9) is replaced by the note payment period variable (X_6). The coefficient for the note payment period indicates that dealers with one month longer note payment periods have an estimated 1.0368 percent less in the percent of fertilizer sales for cash. The coefficient is significant at the .18 probability level and is consistent with theoretical expectations. The coefficients for the other variables in Model 4c are similar to those in Model 4a. However, the R^2 value is lower and the s value higher in Model 4c compared to Model 4a.

A plot of the residuals against the predictions for percent cash using the selected equation (Model 4a) suggests that the distribution of errors does not have a constant variance (heteroscedasticity). This problem was also encountered with the percent note model. However, based on a plot of the residuals, the problem is more severe with the percent cash model. Thus, the estimated partial regression coefficients may be unbiased but do not have the least variance. However, the assumption of independent errors does not appear to be violated based on the Durbin-Watson d statistic for the model.

A plot of the residuals against the observed percent cash shows an upward sloping linear trend. The higher observed values for the percent of sales for cash tend to be under predicted. This also suggests that the regression equation estimates may be biased and indicates why the R^2 value for this equation is low (.1800). A part of this error may be due to measurement or variable omission problems. The dealers having a large percent of sales for cash likely have incentives other than those specified as credit policy variables to encourage their customers to pay on the date of purchase. Also, if the dealer assumed that all fertilizer sales paid in 20 days or less are cash sales rather than account sales, the large observed values may include a substantial amount of measurement error.

FOOTNOTES

[1]J. Johnston, Econometric Methods (New York, 1963), pp. 106-108.

[2]An additional assumption that the errors follow a normal distribution is required to make F or t tests to determine significance levels.

[3]The data for the dependent variables are obtained from questions B_3 and B_{5a} of the questionnaire (see Appendix A).

[4]The definitions of the credit decision variables are in Chapter II. The observed values are obtained from the questionnaire received from each dealer (see Appendix A).

[5]The average number of days for a crop harvest account due period or finance charge period was estimated by determining the approximate number of days from each fertilizer purchase month to the harvest month for small grain and cotton in Oklahoma. This number of days is weighted by the proportion of the state's total dollar fertilizer sales sold in each month. These quantities are then summed over each purchase month in the year. Using this procedure, the account due period for crop harvest terms is quantified as approximately 180 days.

[6]Johnston, p. 222.

[7]If a dummy variable for company stores, say X_{13} is added to a regression equation that includes a b_0 term and variables for the other two types of firms, X_{11}, X_{12}, then the estimation procedure breaks down because the appropriate matrix is singular.

[8]Charles Sappington, "A Numerical Example of the Practical Use of Dummy Variables", Southern Journal of Agricultural Economics (December, 1970), pp. 197-201.

[9]N. R. Draper and H. Smith, Applied Regression Analysis (New York, 1966), p. 134.

[10]Three linear functions are estimated if the two dummy variables, X_{11} and X_{12}, are in the regression equation, one for each type of firm.

[11]Sappington, p. 201.

[12]Several dummy variables to allow for both intercept and slope changes were included in the preliminary analysis. All coefficients for these variables were not significant at the .25 level when included in the regression equations with other variables. Examples of such slope-change dummy variables are $(X_1 \cdot X_7)$, $(X_1 \cdot X_8)$, and $(X_1 \cdot X_9)$.

[13]Draper, p. 169.

[14]Ibid., p. 171.

[15]Ibid., p. 115.

[16]A t-test for the null hypothesis $H_0: \beta_0 = 0$ against the alternative $H_1: \beta_0 \neq 0$ with the appropriate degrees of freedom is used to determine the significance level.

[17]William C. Merrill and Karl A. Fox, Introduction to Economic Statistics (New York, 1970), p. 396.

[18]The independent variable X_1 is the finance charge period if the dealer has a finance charge or the account due period if he has no finance charge. In the discussion of the results, the variable is referred to as the account due period.

[19]When X_2 and X_7 are in the equation together, the coefficients of both variables are less significant than when only one variable is included. This is likely caused by a high correlation between X_2 and X_7 ($r_{2,7} = .92$).

[20]Johnston, p. 192.

[21]Gerhard Tintner, Econometrics (New York, 1952), pp. 154-155.

[22]Johnston, p. 149.

[23]Ibid., p. 150.

[24]Ibid., p. 201.

[25]Merrill, p. 432.

[26]Arthur S. Goldberger, Econometric Theory (New York, 1964), p. 284.

[27]However, the Durbin-Watson d statistic indicates that errors are random and are not serially correlated.

[28]Draper, p. 90.

[29]Johnston, pp. 208-209.

CHAPTER V

RECEIVALBES INVESTMENT COST AND BREAK-EVEN SALES FOR ALTERNATIVE CREDIT POLICIES

Receivables Investment Cost

In Chapter II, the various costs incurred when the dealer finances his customers' purchases were discussed. A major cost is the cost of investing his funds in accounts or notes receivables. Using the statistical relationships between the credit policy variables and credit performance variables developed in Chapter IV and the cost equation illustrated in Chapter II (equation 2-12), the investment cost per dollar of fertilizer sales can be estimated for alternative credit arrangements. These calculations will provide estimates of the possible changes in cost which will occur when the dealer changes a credit decision variable in his credit policy. The other costs associated with sales financing (administrative costs, cash discounts, collection costs and bad debts) are not estimated here, but should not be ignored.

Specification of Alternative Credit Arrangements

The investment cost per dollar of sales is calculated for (1) those dealers having only open-account credit instruments and (2) those dealers having both open-account and promissory-note instruments. Table XXV illustrates the specific values of the credit policy variables for which the estimated receivables investment costs will be calculated.

TABLE XXV

SPECIFIED VALUES FOR THE CREDIT POLICY VARIABLES USED TO CALCULATE THE RECEIVABLES INVESTMENT COSTS

Account Policy Variables	Unit	Specified Values
Account Due Period	days	30, 60, 90, 180
Cash Discount Offered		0, 1
Cash Discount Period	days	0, 10, 20, 30
Finance Charge Imposed		0, 1
Finance Charge Rate	percent/mo.	.5, 1.0, 1.5
Note Policy Variables	**Unit**	**Specified Values**
Interest Rate	percent/yr.	0, 6, 8, 10, 12
Note Payment Period	months	4, 6, 8

The dealer's annual fertilizer sales is a significant independent variable in the percent account equation. The investment costs for the alternative credit arrangements are first calculated assuming the annual fertilizer sales is $170,000. The costs for three selected representative arrangements are then calculated for dealers with $60,000 and $280,000 fertilizer sales.[1]

As discussed in Chapter II, the annual cost of capital rate for an individual dealer depends on his alternative sources of funds and their respective costs. For the purposes of this analysis, the receivables investment cost is first calculated using an 8 percent cost of capital

rate. The costs are also calculated for three selected representative arrangements with a 6 and 10 percent rate. These rates may represent the interest rate for borrowing funds from a lender, the rate of return on an alternative investment or some weighted combination of the two.

Open Account Policies

The cost per dollar of fertilizer sales for having funds invested in accounts receivable depends on the dealer's cost of capital rate and his average annual investment in accounts receivable per dollar of fertilizer sales. Thus,

$$I_a = \Phi\left(\frac{x_a}{100} \cdot \frac{M_a}{365}\right) \qquad (5\text{-}1)$$

where:

I_a = the accounts receivable investment cost per dollar of fertilizer sales,

Φ = the annual cost of capital rate,

x_a = the percent of fertilizer sales on account, and

M_a = the average collection period on accounts receivable.

Using equation (5-1) and the predictions for the percent of sales on accounts (x_a) and the average collection period (M_a) provided by the selected regression equations, the accounts receivable investment cost can be calculated for alternative account policies.[2]

Table XXVI shows the predicted average collection periods for the specified account policies that do not include a finance charge, using equation (4-4) of Chapter IV, the predicted average collection period for dealers with 30-day account due periods and not offering a cash discount is 86.75 days. If the dealer were to offer a 180-day

account due period, the estimated average collection period is longer (195.2 days). However, for a dealer who offers a cash discount, the estimated average collection period is 28.46 days shorter for all account due periods, compared to the policy when no cash discount is offered.

TABLE XXVI

ESTIMATED AVERAGE COLLECTION PERIOD ON ACCOUNTS RECEIVABLE FOR SELECTED ACCOUNT POLICIES (NO FINANCE CHARGE)

Account Due Period	No Cash Discount	Cash Discount Offered
	(days)	(days)
30 days	86.75	58.29
60 days	108.44	79.98
90 days	130.13	101.67
180 days	195.20	166.74

Table XXVII summarizes the effect of alternative finance charge rates upon the estimated average collection period for dealers who impose finance charges. For example, a dealer having a 30-day account due period, no cash discount, and a .5 percent finance charge per month has an estimated average collection period of 135.71 days. However, if the dealer charges 1.0 percent per month, the estimated average collection period decreases to 106.25 days. For each finance charge period

specified, only if the dealer imposes a 1.5 percent per month finance charge rate is the estimated average collection period shorter than the estimated average collection period for a dealer not imposing a finance charge (see Table XXVI). The shortest average collection period shown for the account policies is 48.32 days which results from a 30-day finance charge period combined with a cash discount and 1.5 percent finance charge rate. The longest (244.16 days) results from a 180-day (crop harvest) finance charge period, no cash discount and a .5 percent per month (6 percent per year) finance charge rate.

TABLE XXVII

ESTIMATED AVERAGE COLLECTION PERIOD ON ACCOUNTS RECEIVABLE FOR SELECTED ACCOUNT POLICIES (WITH FINANCE CHARGE)

Finance Charge Period and Rate	No Cash Discount	Cash Discount Offered
	(days)	(days)
30 days		
.5%	135.71	107.25
1.0%	106.25	77.79
1.5%	76.78	48.32
60 days		
.5%	157.40	128.94
1.0%	127.94	99.48
1.5%	98.47	70.01
90 days		
.5%	179.09	150.63
1.0%	149.63	121.17
1.5%	120.16	91.70
180 days		
.5%	244.16	215.70
1.0%	214.70	186.24
1.5%	185.23	156.77

The dealers with only account policies (no notes offered) have sales for cash and on accounts.[3] Since the proceeds for cash sales are not tied up in receivables, the cash sales are not included when calculating the investment cost. However, both the percent of sales for cash and on account are estimated using the selected regression equations (equations 4-5 and 4-7, Chapter IV) and summarized in Table XXVIII.[4] The dealers offering shorter account due periods have a smaller estimated percent of sales on accounts and a larger percent of sales for cash than dealers with longer account due periods. For dealers without cash discounts, the estimated percent of sales on accounts increases from 68.87 percent for 30-day account due periods to 78.42 percent for 180-day account due periods. The percent of sales for cash decreases from 29.95 percent for 30-day account due periods to 21.81 percent for 180-day account due periods. The percent of sales for cash and on account for dealers with cash discounts depends on the length of the cash discount period in addition to the length of the account due period. For policies which include cash discounts, the smallest estimated percent of sales on account (52.93) and the largest estimated percent of sales for cash (46.57) result from a 30-day account due period with a cash discount offered for payments made on the purchase date (cash payments). The largest estimated percent of sales on account (77.62) and the smallest percent of sales for cash (22.36) result from a 180-day account due period with a cash discount for payments within 30 days after the purchase date. Since the finance charge independent variables were not significant at the .20 probability level in these regression equations, the predicted percent of sales on account and for cash do not change given alternative finance charge rates.

TABLE XXVIII

ESTIMATED PERCENT OF FERTILIZER SALES FOR CASH AND ON ACCOUNTS FOR SELECTED ACCOUNT POLICIES, $170,000 FERTILIZER SALES

Finance Charge Period or Account Due Period	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(% of Fertilizer Sales)			
30 days					
Account	68.87	52.93	57.97	63.02	68.07
Cash	29.95	46.57	41.22	35.86	30.51
60 days					
Account	70.78	54.84	59.89	64.93	69.98
Cash	28.33	44.94	39.59	34.23	28.88
90 days					
Account	72.69	56.75	61.80	66.84	71.89
Cash	26.70	43.31	37.96	32.60	27.25
180 days					
Account	78.42	62.48	67.53	72.58	77.62
Cash	21.81	38.43	33.07	27.72	22.36

The estimated accounts receivable investment cost per dollar of fertilizer sales are shown in Table XXIX for account policies which do not include a finance charge and in Table XXX for those that have a finance charge. The policies which contribute to the lowest average collection period and the smallest percent of sales on account produce the smallest accounts receivable investment cost. Assuming an 8 percent cost of capital rate, the dealers not imposing a finance charge (Table XXIX), have estimated investment costs per dollar of fertilizer sales ranging from a low of .68 cents (30-day account due period and a cash discount for payments made on the purchase date) to a high of 3.36

TABLE XXIX

ESTIMATED ACCOUNTS RECEIVABLE INVESTMENT COST PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT POLICIES (NO FINANCE CHARGE) $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE

Account Due Period	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 days	1.31	.68	.74	.80	.87
60 days	1.68	.96	1.05	1.14	1.23
90 days	2.07	1.26	1.38	1.49	1.60
180 days	3.36	2.28	2.47	2.65	2.84

TABLE XXX

ESTIMATED ACCOUNTS RECEIVABLE INVESTMENT COST PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT POLICIES (WITH FINANCE CHARGE) $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE

Finance Charge Period and Finance Charge Rate	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 day period					
.5%	2.05	1.24	1.36	1.48	1.60
1.0%	1.60	.91	1.00	1.09	1.18
1.5%	1.16	.51	.61	.67	.72
60 day period					
.5%	2.44	1.55	1.69	1.84	1.98
1.0%	1.98	1.20	1.31	1.42	1.53
1.5%	1.53	.84	.92	1.00	1.07
90 day period					
.5%	2.85	1.87	2.04	2.21	2.37
1.0%	2.38	1.51	1.64	1.78	1.91
1.5%	1.91	1.14	1.24	1.34	1.44
180 day period					
.5%	4.20	2.95	3.19	3.43	3.67
1.0%	3.69	2.55	2.76	2.96	3.17
1.5%	3.18	2.15	2.32	2.49	2.67

cents (180-day account due period with no cash discount offered). For dealers imposing a finance charge (Table XXX), the cost per dollar of fertilizer sales range from .51 cents (30-day account due period, cash discount offered for payments on the purchase date and a 1.5 percent per month finance charge rate) to 4.20 cents (180-day account due period, no cash discount, and a .5 percent finance charge rate per month). The costs expressed in cents per dollar of fertilizer sales may seem small. However, when expressed as the total investment cost for a dealer with $170,000 fertilizer sales, investment costs are quite large and exhibit a considerable amount of variation among the alternative account policies. For example, a dealer with an investment cost per dollar of fertilizer sales equal to 4.20 cents would incur interest or opportunity costs on the accounts receivable investment equal to approximately $7140 per year. The average annual investment in accounts receivables would be approximately $89,250 (7140/.08). In contrast, the least cost credit policy with a .51 cent per dollar of fertilizer sales investment cost would result in an annual interest cost of only $867 and an average investment in receivables of $10,838.

The dealer's cost of capital rate is an important factor in the investment cost function. Table XXXI summarizes the effect of alternative cost of capital rates on the cost per dollar of fertilizer sales and the total accounts receivable investment cost for three alternative account arrangements. The size of the investment is not affected by the cost of capital rate. Assuming $170,000 fertilizer sales and an eight percent cost of capital rate, the cost per dollar of fertilizer sales is approximately 1.16 cents if a dealer offers a 30-day finance charge period, imposes a 1.5 percent per month finance charge, and

TABLE XXXI

ESTIMATED ACCOUNTS RECEIVABLE INVESTMENT COST PER DOLLAR OF FERTILIZER SALES, TOTAL ANNUAL COST, AND AVERAGE ANNUAL INVESTMENT FOR SELECTED ACCOUNT POLICIES, FERTILIZER SALES AND COST OF CAPITAL RATES

Fertilizer Sales and Cost of Capital Rate	Arrangements[a]								
	#1			#2			#3		
	Cost/$	Total Cost	Average Investment	Cost/$	Total Cost	Average Investment	Cost/$	Total Cost	Average Investment
	¢	$	$	¢	$	$	¢	$	$
$60,000									
6%	.7858	471	7,858	.9983	599	9,990	1.8078	1,085	18,078
8%	1.0478	629	7,858	1.3317	799	9,990	2.4104	1,446	18,078
10%	1.3098	786	7,858	1.6650	999	9,990	3.0130	1,808	18,078
$170,000									
6%	.8693	1,478	24,631	1.1307	1,922	32,028	1.9888	3,381	56,355
8%	1.1591	1,970	24,631	1.5071	2,562	32,028	2.6518	4,508	56,355
10%	1.4489	2,463	24,631	1.8841	3,203	32,028	3.3147	5,635	56,355
$280,000									
6%	.9528	2,668	44,465	1.2625	3,535	58,912	2.1702	6,077	101,276
8%	1.2704	3,557	44,465	1.6832	4,713	58,912	2.8936	8,102	101,276
10%	1.5880	4,447	44,465	2.1039	5,891	58,912	3.6170	10,128	101,276

[a]Arrangements: #1 - 30-day finance charge period, 1.5% finance charge rate, no cash discount, #2 - 90-day finance charge period, 1.0% finance charge rate, cash discount period is purchase date, and #3 - 180-day account due period, cash discount period is 20 days, no finance charge.

offers no cash discount. This account policy (arrangement #1) results in an average annual investment of $24,631 and a total investment cost per year of $1,970. However, if the dealer has a 10 percent opportunity cost rate, the cost per dollar of sales is 1.45 cents and the total cost is $2,463 per year. The estimated investment cost per dollar of sales for the same account policy is only .87 cents if the dealer's cost of capital rate is 6 percent per year resulting in a total annual investment cost of $1,478.

The effects of a lower or higher cost of capital rate upon the receivables investment cost for other account policies are similar. In general, for a given policy, the change in the cost of capital rate from 8 percent to 6 percent or 10 percent results in a 25 percent decrease or increase in the cost estimates. For example, the investment cost per dollar of sales for a 90-day account due period, a one percent finance charge rate and a cash discount for payments made on the purchase date (arrangement #2) is 1.13, 1.51, and 1.88 cents for 6, 8, and 10 percent cost of capital rates, respectively. The annual accounts receivable investment cost also increases as the cost of capital rate increases. An account policy (arrangement #3) with more liberal payment terms (180-day account due period, no finance charge, and a cash discount for payments made in 20 days) results in a larger estimated average annual investment and a higher annual investment cost for each specified annual interest rate than the other two policies (see Table XXXI, $170,000 sales).

Since the level of fertilizer sales was a significant variable (with a positive coefficient) in explaining the percent of sales on account, the average annual investment in receivables and the cost per

dollar of fertilizer sales is smaller for dealers with fertilizer sales less than $170,000 and larger for dealers with annual fertilizer sales greater than $170,000, for a given account policy. The effect of the dealers' size measured by the annual fertilizer sales upon the investment and investment cost is also shown in Table XXXI. Assuming an 8 percent cost of capital rate, a dealer with $60,000 annual sales offering account arrangement #1 has a cost per dollar of fertilizer sales of 1.05 cents compared to 1.16 cents for a dealer with $170,000 sales. The difference in the cost per dollar of fertilizer sales is small (.11 cents), but the average investment ($7,858) and the total annual cost ($629) for the dealer with only $60,000 sales is much smaller than the $24,631 investment and the $1,970 cost for a $170,000 sales dealer. In contrast, a large dealer with $280,000 fertilizer sales has a 1.27 cent investment cost per dollar of sales, a $44,465 average annual investment and a $3,557 total investment cost (assuming an 8 percent cost of capital rate). For arrangement #1, a $110,000 change in the sales level changes the investment cost per dollar by approximately 9.6 percent for any given cost of capital rate.[5] For arrangements #2 and #3, the cost per dollar of fertilizer sales changes by approximately 11.65 percent and 9.1 percent, respectively, given a $110,000 change in the sales level.

Account-Note Policies

If a dealer finances his sales with both open-accounts and promissory-notes, he has funds tied up in accounts and notes receivable. The cost per dollar of fertilizer sales will likely be different for the investment in accounts receivable than for investments in notes

receivable. Also, if note arrangements are available, the accounts receivable investment and investment cost will probably be lower than if note financing is not offered. The combined receivables investment cost per dollar of sales will probably be different for account-note financing than for only account financing.

The total receivables investment cost per dollar of fertilizer sales is the sum of the accounts and notes receivables investment costs. Thus,

$$I = \Phi\left(\frac{x_a}{100} \cdot \frac{M_a}{365}\right) + \Phi\left(\frac{x_n}{100} \cdot \frac{M_n}{12}\right) \qquad (5\text{-}2)$$

where:

I = the average receivables investment cost per dollar of fertilizer sales,

Φ = the annual cost of capital rate,

x_a = the percent of fertilizer sales on accounts,

M_a = the average collection period on accounts (days),

x_n = the percent of fertilizer sales on notes, and

M_n = the note payment period (months).

Using the estimated regression equations shown in Chapter IV (4-4, 4-5, and 4-6), and the cost equation (5-2), the investment costs for both accounts and notes receivable assuming alternative account and note policies will be calculated. The results can be compared to those for only account financing.

The estimated average collection period on accounts receivable is 20.75 days shorter for policies which include note financing compared to the collection periods for the same account policies which do not include note financing (refer to Tables XLII and XLIII in Appendix B).

For example, the estimated average collection period for an account-note policy with a 30-day finance charge period, a cash discount, and a 1.5 percent finance charge rate is 27.57 days (Table XLIII) compared to 48.32 days (Table XXVII) for the same account policy without note financing.

In addition, the estimated percent of sales on account is 16.12 percent smaller for account-note policies than for the same account policies without note financing offered. The percent of fertilizer sales for cash is also smaller by 8.91 percent for policies with notes compared to those without notes (refer to Table XLIV in Appendix B). For example, an account-note policy with a 30-day account due period and a cash discount for payments made in 10 days results in an estimated 41.86 percent of sales on accounts and 32.30 percent for cash compared to 57.77 and 41.22 percent, respectively, for the same policies without note financing (refer to Table XXVIII).[6]

Using the estimates for the average account collection period and the percent of fertilizer sales on account, the accounts receivable investment cost per dollar of fertilizer sales for alternative account policies (assuming notes are available) can be calculated. The results are summarized in Tables XXXII (account-note policies without finance charges) and Table XXXIII (account-note policies with finance charges). The estimated accounts receivable investment cost per dollar of fertilizer sales is smaller for each alternative account policy when note financing is available compared to the costs when note financing is not offered. (Compare costs in Tables XXXII and XXXIII to costs in Tables XXIX and XXX). The accounts receivable investment cost for account-note financing does not include the cost of funds which are invested in notes

receivable. The accounts receivable investment costs per dollar of fertilizer sales when note financing is available range from .22 cents for a 30-day account due period, a cash discount for payments on the purchase date and a finance charge rate of 1.5 percent per month to 3.05 cents for a 180-day account due period, no cash discount and a .5 percent finance charge rate per month (Table XXXIII).

TABLE XXXII

ESTIMATED ACCOUNTS RECEIVABLE INVESTMENT COST PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT-NOTE POLICIES (NO FINANCE CHARGE) $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE

Account Due Period	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 days	.76	.30	.34	.39	.43
60 days	1.05	.50	.57	.63	.70
90 days	1.36	.72	.81	.90	.99
180 days	2.38	1.48	1.65	1.81	1.97

Next, using the selected regression equation (equation 4-6, Chapter IV), the percent of fertilizer sales on notes can be estimated for alternative note payment periods and note interest rate charges. A summary of these estimates is shown in Table XXXIV. If the note payment

TABLE XXXIII

ESTIMATED ACCOUNTS RECEIVABLE INVESTMENT COST PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT-NOTE POLICIES (WITH FINANCE CHARGE) $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE

Finance Charge Period and Finance Charge Rate	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 day period					
.5%	1.33	.70	.79	.89	.98
1.0%	.98	.32	.37	.41	.46
1.5%	.65	.22	.25	.28	.31
60 day period					
.5%	1.64	.92	1.04	1.16	1.28
1.0%	1.28	.67	.75	.84	.93
1.5%	.93	.42	.47	.53	.58
90 day period					
.5%	1.96	1.16	1.30	1.44	1.59
1.0%	1.60	.89	1.01	1.12	1.23
1.5%	1.23	.63	.71	.79	.87
180 day period					
.5%	3.05	1.98	2.20	2.41	2.63
1.0%	2.65	1.68	1.86	2.05	2.23
1.5%	2.25	1.38	1.53	1.68	1.83

TABLE XXXIV

ESTIMATED PERCENT OF FERTILIZER SALES ON NOTES
FOR SELECTED NOTE POLICIES

Note Payment Period	Annual Interest Rate Charged				
	0%	6%	8%	10%	12%
	(percent of fertilizer sales)				
4 months	41.94	22.48	16.00	9.51	3.03
6 months	49.88	30.42	23.94	17.46	10.96
8 months	57.82	38.37	31.88	25.40	18.91

period is 6 months and the note interest rate is 8 percent, the estimated percent of sales on notes is 23.94 percent.[7] The percent of sales on notes for interest rates less than 8 percent and note payment periods greater than 6 months is greater than 24 percent. For interest rates greater than 8 percent and note payment periods less than 6 months, the percent of sales on notes is less than 24 percent. The sum of the estimated percent of sales on notes, on accounts, and for cash should be approximately 100 percent. The estimated percent of sales for cash plus the estimated percent of sales on accounts for the alternative account-note policies range from 73.54 to 75.84 percent (see Table XLIV, Appendix B). If the note policy is an 8 percent interest rate and a 6 month note payment period, the sum of estimated percent of sales on accounts, on notes and for cash is approximately 98 percent for all alternative account policies. For all other specified note policies this sum deviates from 100 percent by a larger amount. Table XLV in Appendix B summarizes the sums of the estimated percent of sales on accounts, on notes and for cash for several account-note policies. The sums range from 76.82 percent to 133.66 percent. A possible explanation for these wide deviations from 100 percent is that none of the account policy variables which were statistically significant in the percent note regression equation were significant in the percent account or percent cash regression equations. Thus, a predicted increase in the percent of sales on notes due to a change in a note policy variable is not offset by a change in the predicted percent cash or percent account.

The estimated notes receivable investment cost per dollar of fertilizer sales can be calculated by taking the product of the annual cost of capital rate (Φ), the proportion of sales on notes (percent notes/

100 percent) and the average proportion of the year notes are outstanding (note payment period/12 months). As shown in Table XXXV, the notes receivable investment cost increases as the note payment period increases or as the note interest rate decreases. Assuming the dealers cost of capital rate is 8 percent, the costs range from .08 cents per dollar of fertilizer sales (a 12 percent annual interest rate and a 4 month note payment period) to 3.08 cents per dollar of fertilizer sales (a zero rate of interest and an 8 month note payment period). For the average note policy (6 month note payment period and an 8 percent interest rate), the cost per dollar of fertilizer sales is nearly one cent (.96 cents).

TABLE XXXV

ESTIMATED NOTES RECEIVABLES INVESTMENT COST PER DOLLAR OF FERTILIZER SALES FOR SELECTED NOTE POLICIES, EIGHT PERCENT COST OF CAPITAL RATE

Note Payment Period	Annual Interest Rate Charged				
	0%	6%	8%	10%	12%
	(cents per dollar of sales)				
4 months	1.12	.60	.43	.25	.08
6 months	2.00	1.22	.96	.70	.44
8 months	3.08	2.04	1.70	1.35	1.01

The estimated combined receivables investment cost (for both notes and accounts) per dollar of fertilizer sales for alternative account-note policies is estimated by adding the estimated note receivable investment cost (Table XXXV) to the estimated accounts receivable investment cost (Table XXXII or XXXIII). The receivables investment costs are calculated assuming a 6 month note payment period and an 8 percent annual note interest rate. The costs for the alternative account policies are summarized in Tables XXXVI and XXXVII. As shown in Table XXXVI the estimated combined receivables investment costs per dollar of fertilizer sales for policies without finance charges on accounts range from 1.26 cents (30-day account due period and cash discount for payments on the purchase date) to 3.34 cents (180-day account due period and no cash discount). These cost estimates assume that the dealer's annual sales is $170,000 and his cost of capital rate is 8 percent. These costs can be compared to the cost for policies that do not include note financing (Table XXIX). If the dealer's account due period is 30, 60 or 90 days, the receivables investment cost per dollar of fertilizer sales is smaller for policies with only accounts than for policies with both accounts and notes. Also, if the account due period is 180-days and a cash discount is offered, the receivables investment cost per dollar of fertilizer sales is smaller for the policies with only accounts. If note policies with note payment periods different than 6 months or annual interest rates other than 8 percent are considered, the comparison of account-note policy costs with account policy costs would yield different results. The total receivables investment costs for other note policies are not calculated since the sum of the percent of sales on accounts, on notes, and for cash deviates considerably from 100 percent.

TABLE XXXVI

ESTIMATED COMBINED RECEIVABLE INVESTMENT COST (NOTES AND ACCOUNTS) PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT-NOTE POLICIES (NO FINANCE CHARGE) $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE[a]

Account Due Period	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 days	1.72	1.26	1.30	1.35	1.39
60 days	2.01	1.46	1.53	1.59	1.66
90 days	2.32	1.68	1.77	1.86	1.95
180 days	3.34	2.44	2.61	2.77	2.93

[a]Note Policy: Payment period is 6 months and annual interest rate is 8 percent.

As shown in Table XXXVII, the total receivables investment cost per dollar of fertilizer sales (accounts and notes) for dealers imposing an account finance charge range from 1.18 cents (30-day account due period, cash discount for payments on the purchase date and a 1.5 percent finance charge rate) to 4.01 cents (180-day account due period, no cash discount, .5 percent finance charge rate). For dealers with finance charges, the estimated receivables cost for 30, 60 or 90 day finance charge periods is lower for policies with only accounts (Table XXX) than for the account-note policies. Also, if the account due period is 180 days, the finance charge rate is one percent or higher and a cash discount is offered, the cost estimates are lower for account

TABLE XXXVII

ESTIMATED COMBINED RECEIVABLE INVESTMENT COST (NOTES AND ACCOUNTS) PER DOLLAR OF FERTILIZER SALES FOR SELECTED ACCOUNT-NOTE POLICIES (WITH FINANCE CHARGE), $170,000 FERTILIZER SALES, EIGHT PERCENT COST OF CAPITAL RATE[a]

Finance Charge Period and Finance Charge Rate	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(cents per dollar of fertilizer sales)			
30 days					
.5%	2.29	1.66	1.75	1.85	1.94
1.0%	1.94	1.28	1.33	1.37	1.42
1.5%	1.61	1.18	1.21	1.24	1.27
60 days					
.5%	2.60	1.88	2.00	2.12	2.24
1.0%	2.24	1.63	1.71	1.80	1.89
1.5%	1.89	1.38	1.43	1.49	1.54
90 days					
.5%	2.92	2.12	2.36	2.40	2.55
1.0%	2.56	1.85	1.98	2.08	2.19
1.5%	2.19	1.59	1.67	1.75	1.83
180 days					
.5%	4.01	2.94	3.16	3.37	3.59
1.0%	3.61	2.64	2.82	3.01	3.19
1.5%	3.21	2.34	2.49	2.64	2.79

[a]Note Policy: Payment period is 6 months and annual interest rate is 8 percent.

policies than for account-note policies. For dealers with .5 percent finance charge rates or with 1.0 percent finance charge rates and no cash discount, the account-note policy results in a slightly lower cost per dollar of sales than a policy with only accounts. Also, if the cost for a note policy with a note payment period shorter than 6 months or an interest rate greater than 8 percent could be accurately estimated, the receivables investment cost per dollar of fertilizer sales may be less for account-note financing than for financing with only accounts.

Impact of a Change in Credit Policy on Sales

The receivables investment cost analysis indicates that there are substantial differences in the investment cost per dollar of fertilizer sales among alternative credit arrangements. If other credit costs are added to the investment costs, the differences are likely to be even greater. This suggests that dealers who have high cost credit arrangements could likely achieve substantial savings if they would change to a low cost credit arrangement. For example, suppose a dealer offers a crop harvest finance charge period and imposes a one percent finance charge rate after 180 days. No note financing or cash discounts are offered. Assuming the dealer's fertilizer sales is $170,000 and his cost of capital rate is 8 percent, the estimated accounts receivable investment cost per dollar of fertilizer sales for this policy is 3.69 cents (see Table XXX). If the dealer could change to a 30-day finance charge period, his estimated cost per dollar of fertilizer sales would be only 1.60 cents. Provided the level of fertilizer sales

is constant at $170,000 and other costs do not change, the dealer would achieve a cost savings or additional profit of 2.09 cents per dollar of fertilizer sales.

However, the determination of whether or not a change in the credit policy is desirable depends on the impact of that change on sales and profits as well as on credit costs. A less lenient credit policy (a shorter account due period, higher finance charge, etc.) will likely result in lower credit costs, but unless the dealer's competitors also adopt shorter terms, the dealer may lose a part of his market share of sales.

Break-Even Analysis

A break-even analysis can be used to determine the break-even level of fertilizer sales needed to maintain constant firm profit when a dealer makes a change in his credit policy. This break-even sales level can then be compared to his estimates of the reduction in sales that would result from the credit policy change. The break-even level of sales that will result in the same firm profit is calculated by the following formula:

$$S_b = \frac{S_i\ (\Pi)}{\Pi + (I_1 - I_2) + (V_1 - V_2)} \qquad (5\text{-}3)$$

where:

S_b = the break-even sales with the new credit policy ($),

S_i = the initial sales with the present credit policy ($),

Π = the initial profit margin per dollar of sales after deducting all costs including I_1 and V_1 ($),

I_1 = the estimated receivables investment cost per dollar of fertilizer sales for the present credit policy ($),

I_2 = the estimated receivables investment cost per dollar of fertilizer sales for the new credit policy ($),

V_1 = other variable costs (production, marketing and credit) per dollar of sales for the present credit policy ($), and

V_2 = other variable costs (production, marketing, and credit) per dollar of sales for the new credit policy ($).

The values for S_i, Π, I_1 and V_1 are assumed to be known by the dealer. For account policies the receivable investment cost for the new policy (I_2) is a function of the estimated percent of sales on accounts, the estimated average collection period on account sales and the dealer's cost of capital rate. Thus,

$$I_2 = \Phi\left(\frac{x'_a}{100} + \frac{.0601S_b}{1000 \cdot 100}\right)\left(\frac{M_a}{365}\right) \qquad (5\text{-}4)$$

where:

Φ = the dealer's annual cost of capital rate (decimal),

x'_a = the estimated percent of sales on accounts excluding the effect of the level of fertilizer sales for the new credit policy,

$.0601S_b$ = the coefficient for the level of fertilizer sales (in the percent account regression equation) times the break-even level of fertilizer sales, and

M_a = the estimated average collection period for the new credit policy (days).

The estimated change in the dealer's receivables investment cost associated with a change in his credit policy is $I_1 - I_2$. The change in other variable costs due to a change in his credit policy is $V_1 - V_2$. The impact of a change in the credit decision variables upon other

credit costs or upon the variable production and marketing cost is not empirically estimated here. However, these possible cost changes should not be ignored when evaluating a change in credit policy.

The regression equations are used to estimate M_a and x_a' for the new account policy. Then equation (5-4) is substituted for I_2 in the break-even sales equation (equation 5-3). The break-even sales (S_b) needed to maintain the same firm profit given a change in the account policy is determined by solving equation (5-3) using the quadratic formula. The break-even sales level could also be determined for account-note policies by substituting the receivables investment cost for both accounts and notes for I_2 in equation (5-3).

Application of the Break-Even Analysis

For illustrative purposes the break-even analysis will be applied to situations in which the dealer changes to a lower cost account policy. Assume that the dealer's initial level of fertilizer sales (S_1) is $170,000 and his present profit margin (Π) is five cents on each dollar of sales. Thus, the dealer's annual profit on fertilizer sales is $8,500. Also, assume that other variable costs per dollar of sales do not change given a change to a lower cost credit policy ($V_1 - V_2 = 0$). If the dealer presently offers his customers a 180-day account due period, no cash discount, and imposes a 1.0 percent finance charge on accounts unpaid after 180 days, his average collection period would be approximately 215 days and 78 percent of his sales would be on accounts (see Tables XXVII and XXVIII). Assuming the dealer's cost of capital rate is 8 percent, the receivables investment cost per dollar of fertilizer sales for this policy is estimated to be 3.69 cents (Table XXX).[8]

The break-even levels of sales and the sales reductions that could occur and still maintain constant total net profit if the dealer shortens his account due period to 90, 60 or 30 days are shown in Table XXXVIII.

By changing his credit policy to a 90-day account due period, the dealer's estimated receivables investment cost per dollar of sales decreases from 3.69 cents to 2.31 cents. Assuming other costs do not change, the dealer's annual sales could decrease from $170,000 to approximately $132,927 (a $37,073 decrease) and his net profit would remain at $8,500.[9] Due to the decline in the investment cost per dollar of sales, the dealer's profit margin would be increased from 5 to 6.38 cents (5 + 3.69 - 2.31) per dollar of sales. If the dealer estimates that changing to a 90-day account due period would result in less than a $37,073 decline in sales, then the change would increase his annual net profit. However, if he expects sales to fall more than $37,073, profit would decrease by changing policies. If the dealer were to change from the 180-day account due period to 60-day or 30-day terms, the receivables investment cost per dollar of sales would be even lower than for the 90-day terms. Given these lower costs, sales could fall by $44,659 for a change to a 60-day period and by $51,136 for a change to a 30-day period.

Table XXXIX illustrates the break-even sales which could occur given increases in the finance charge rate. Suppose the dealer's initial credit terms are a 30-day account due period with a .5 percent per month finance charge rate after 30 days. For a change in the account policy to a one percent per month finance charge rate, the estimated accounts receivables investment cost per dollar of sales

TABLE XXXVIII

ESTIMATED AVERAGE COLLECTION PERIOD, PERCENT OF SALES ON ACCOUNTS, INVESTMENT COST PER DOLLAR OF SALES, BREAK-EVEN SALES AND SALES REDUCTION FOR CHANGES IN THE LENGTH OF THE ACCOUNT DUE PERIOD[a]

Account Policy	Average Collection Period	Percent of Sales on Accounts	Investment Cost per Dollar of Sales	Break-even Sales	Sales Reduction
	(days)	(%)	(¢)	($)	($)
Initial Policy					
180-Day Account Due Period, 1% Finance Charge Rate	214.70	78.42	3.69	--	--
New Policy					
90-Day Account Due Period, 1% Finance Charge Rate	149.63	70.46	2.31	132,927	37,073
60-Day Account Due Period, 1% Finance Charge Rate	127.94	68.09	1.91	125,341	44,659
30-Day Account Due Period, 1% Finance Charge Rate	106.25	65.79	1.53	118,864	51,136

[a]The initial fertilizer sales level is $170,000, the initial profit margin is 5 cents per dollar of sales and the annual cost of capital rate is 8 percent.

TABLE XXXIX

ESTIMATED AVERAGE COLLECTION PERIOD, PERCENT OF SALES ON ACCOUNTS, INVESTMENT COST PER DOLLAR OF SALES, BREAK-EVEN SALES AND SALES REDUCTION FOR CHANGES IN THE FINANCE CHARGE RATE[a]

Account Policy	Average Collection Period	Percent of Sales on Accounts	Investment Cost per Dollar of Sales	Break-even Sales	Sales Reduction
	(days)	(%)	(¢)	($)	($)
Initial Policy					
30-Day Account Due Period, .5% Finance Charge Rate	135.71	68.87	2.05	--	--
New Policy					
30-Day Account Due Period, 1% Finance Charge Rate	106.25	68.02	1.58	155,986	14,014
30-Day Account Due Period, 1.5% Finance Charge Rate	76.78	67.29	1.13	143,747	26,253

[a]The initial fertilizer sales level is $170,000, the initial profit margin is 5 cents per dollar of sales and the annual cost of capital rate is 8 percent.

would decline from 2.05 cents to 1.58 cents. The major part of this change in cost is brought about by a decline in the estimated average collection period from 136 to 106 days. Assuming other costs do not change, the dealer would not have a reduction in profit unless sales decline to less than $155,986 (decline by $14,014). If the dealer changes his finance charge rate from .5 to 1.5 percent per month, sales could fall to $143,747 without affecting his net profit.

Next, consider the initial account policy as a 60-day account due period and a 1.5 percent per month finance charge after 60 days. No cash discount is offered with the present policy. If the dealer were to offer a cash discount for payments on the purchase date, the estimated cost per dollar of sales for investing funds in accounts receivable would decline from 1.53 cents to .82 cents (see Table XL). If no other costs change, his sales could fall from $170,000 to $149,024 without affecting profit. However, the revenue lost from cash discounts granted to customers who pay on the purchase date must also be considered. Suppose the cash discount rate is 2 percent. As shown in Table XL, if the cash discount is offered for payments on the purchase date, 53.58 percent of the fertilizer sales will be on account. Thus, approximately 46.42 percent of the sales will be paid for in cash on the purchase date.[10] Therefore, for every dollar of sales, the dealer foregoes .93 cents (.02 x .4642) in cash discounts. The investment cost per dollar of sales plus the revenue lost from the cash discounts per dollar of sales is 1.75 cents (.93 + .82). For the above initial credit policy, the change from not offering a cash discount to offering a cash discount would increase the credit cost per dollar of sales when both the cash discount and the investment costs are considered. The results

TABLE XL

ESTIMATED AVERAGE COLLECTION PERIOD, PERCENT OF SALES ON ACCOUNTS, INVESTMENT COST PER DOLLAR OF SALES, BREAK-EVEN SALES AND SALES REDUCTION FOR CHANGES IN CASH DISCOUNT POLICIES[a]

Account Policy	Average Collection Period	Percent of Sales on Accounts	Investment Cost per Dollar of Sales	Break-even Sales	Sales Reduction
	(days)	(%)	(¢)	($)	($)
Initial Policy					
60-Day Account Due Period, 1.5% Finance Charge Rate, No Cash Discount	98.47	70.78	1.53	--	--
New Policy					
60-Day Account Due Period, 1.5% Finance Charge Rate, Cash Discount for Payments on Purchase Date	70.01	53.58	.82	149,024	20,976
60-Day Account Due Period, 1.5% Finance Charge Rate, Cash Discount for Payments Within 30 Days	70.01	69.11	1.06	155,640	14,360

[a]The initial fertilizer sales level is $170,000, the initial profit margin is 5 cents per dollar of sales and the annual cost of capital rate is 8 percent.

would likely be different if other initial sales levels, profit margins, or cost of capital rates are assumed.

Table XL also shows the change in the investment cost and the sales reduction which could occur for a change from not offering a cash discount to offering a cash discount for payments made in 30 days. Since a longer cash discount period increases the estimated percent of sales on accounts, the investment cost savings and the sales reduction are less for a 30-day cash discount period than for a cash discount for payments made on the purchase date. These costs do not include the revenue lost when cash discounts are granted.

As indicated in equation (5-3), the break-even sales reductions that can occur for a given change in credit policy depends on the dealer's initial profit margin. Suppose a dealer presently offers a 180-day finance charge period and charges one percent per month on accounts not paid after 180 days. Table XLI illustrates the break-even sales for a change to a 90-day finance charge period assuming three alternative initial profit margins--3, 5, and 7 cents per dollar of sales. The sales reduction that can occur assuming a 3 cent initial profit margin and a $170,000 initial sales level is $53,942 compared to only $27,813 for a 7 cent profit margin. Thus, given the same change in credit policy, dealers with small profit margins can sacrifice more sales and maintain constant profit than can dealers with larger profit margins.

The break-even analysis procedure could also be applied to changes to a higher cost credit policy. The dealer could determine how much his sales would need to increase to cover the additional investment cost per dollar of sales in order to maintain constant profit. However,

since most dealers are concerned with reducing their credit costs, changes to less lenient credit policies are not evaluated.

TABLE XLI

BREAK-EVEN SALES AND SALES REDUCTION FOR A CHANGE FROM A 180-DAY TO A 90-DAY ACCOUNT DUE PERIOD ASSUMING ALTERNATIVE PROFIT MARGINS[a]

Initial Profit Margin	Break-even Sales	Sales Reduction
(cents)	($)	($)
3	116,058	53,942
5	133,927	37,073
7	142,187	27,813

[a]The initial and new policy include a 1.0 percent finance charge rate. The initial level of fertilizer sales is $170,000 and the annual cost of capital rate is 8 percent.

FOOTNOTES

[1]The mean fertilizer sales for the 89 dealers that offer financing is approximately $170,000 and the standard deviation is approximately $110,000.

[2]Recall that the regression equations estimated for the average collection period and the percent of sales on accounts resulted in estimates which under predicted the large observed values and over predicted the small observed values. Thus, the resulting cost estimates may also be biased in a similar fashion.

[3]The sales financed by the local bank are excluded. The percent of sales for cash and on account should add to approximately 100 percent.

[4]For Table XXVIII, it is assumed that the dealer's annual fertilizer sales is $170,000.

[5]Due to rounding, the cost per dollar for the alternative sales levels may not be exactly 9.6 percent less than or greater than the cost per dollar for the $170,000 sales level.

[6]The percent of sales for cash and on accounts for account-note policies do not add to 100 percent because a part of the dealer's sales are financed with notes (see Table XLIV in Appendix B).

[7]Eight percent is approximately the average interest rate charged on notes and 6 months is the average payment period.

[8]The percent of sales on account, the average collection period and the investment cost for the initial credit policy are assumed to be those values estimated with the regression and cost equations for that specified policy.

[9]If other variable costs per dollar of sales (V) increase (decrease) due to a change in credit policy, the break-even sales level would be smaller (larger).

[10]No note financing is available, thus, the percent cash is equal to 100 percent minus the percent on accounts.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The Problem and Procedure

In an effort to maintain or increase the market share of sales in a highly competitive marketing environment, farm input dealers offer their customers numerous services. Dealer financing is one of the services most frequently employed as a means to compete with other dealers for sales. Dealer financing may provide a convenient, additional source of short-term debt capital needed by the farmer. If acceptance of the buyers' credit in exchange for merchandise increases the dealer's rate of sales, then the dealer may obtain cost efficiencies by spreading his fixed costs over increased sales. However, to provide the finance service, the dealer will incur additional administrative and investment costs. The profitability of a dealer's financing activities depends not only upon changes in sales but also on the additional costs incurred when a customer's purchases are financed. Farm input dealers concerned with increasing their market shares frequently do not recognize the impact of their financing activities on cost.

One of the major costs associated with the dealer's financing activity is the cost of investing operating funds in accounts and notes receivable. In recent years, high interest rates and the limited

availability of operating funds have heightened the concern among dealers regarding the management of receivables. One of the financial management skills required in the management of receivables is selection of the appropriate credit instrument and the determination of the credit policy to use to finance sales.

The major objective of this study is to provide farm input dealers, particularly Oklahoma fertilizer dealers, with information to help them make decisions concerning the use of alternative credit instruments and policies. The focus of the analysis is on impact of the dealer's credit policy upon the cost of investing funds in receivables. The first specific objective of this study is to identify and describe the alternative credit policy decision variables and the credit instruments which are offered by Oklahoma fertilizer dealers. The second objective is to empirically estimate the impact of the alternative credit instruments and the specific values of the credit policy decision variables upon selected credit performance measures. And finally, using the estimates for the credit performance measures, the receivables investment cost per dollar of sales is calculated for alternative credit policies.

The principles of economic theory and financial management are used to develop the conceptual relationship between a dealer's credit policy and the receivables investment cost. The dealer's credit policy consists of the type of credit instrument used and the set of credit policy decision variables offered to customers. The credit policy decision variables determine the cost the farmer pays to obtain financing from a dealer. The finance cost associated with the dealer's credit policy influences the farmer's purchase and payment decisions. The buyer's behavior has a direct impact on two of the determinants of

the dealer's receivable investment cost--the proportion of the dealer's sales financed and the average collection period on credit sales. These two credit performance variables are hypothesized to be functions of the credit policy variables.

To obtain data for the investigation of alternative credit policies and their impact on the credit performance measures, a questionnaire was mailed to Oklahoma fertilizer dealers. The credit policies of the dealers responding to the questionnaire were described and compared for alternative types and sizes of firms. Next, using a multiple linear regression procedure, the changes in the selected credit performance variables due to changes in significant credit policy variables were empirically estimated. Utilizing the estimates for the average collection period and the proportion of the dealer's sales financed, the investment costs per dollar of sales for alternative credit policies were calculated. The cost estimates are then used to evaluate a change in the dealer's credit policy in terms of the break-even level of sales.

Summary of Findings

Alternative Credit Policies

Nearly all (93 percent) of the fertilizer dealers offered open-account financing to their customers. The credit policy decision variables employed by the dealers utilizing the open-account instrument were the account due period, finance charge period, finance charge rate, cash discount rate, cash discount period, collection practices, and credit standards.

The account due periods ranged from 30 days after the purchase date to the time of the farmer's crop harvest (approximately 180 days). Approximately 39 percent of the dealers with account policies had crop harvest terms. Nearly three-fourths of the dealers imposed a finance charge on accounts not paid during a specified number of days after the purchase date. The finance charge rates ranged from .5 to 1.5 percent per month. However, only 37 percent of the dealers with account policies offered cash discounts to customers for payments made during the cash discount period. The cash discount rates ranged from 2 to 5 percent of the purchase price. Over two-thirds of the dealers that offer cash discounts for early payments had cash discount periods of 30 to 60 days after the purchase date. Over one-fourth of the dealers had both cash discounts and finance charges, but 17 percent had neither a cash discount or a finance charge. The collection practice most frequently utilized was a written notice once a month. Over 30 percent of the dealers did not require any credit application or financial statement from new credit customers.

Over one-half of the dealers who offered account financing also had note financing available. However, only two dealers offered only note financing. The credit policy decision variables utilized by dealers with note financing were the note payment period, the interest rate, and the issue date. The average annual interest rate charged by the dealers on notes was 8 percent. The rates ranged from zero to 12 percent per year. The average note payment period or the average length of time the dealers' notes were outstanding was 6 months. The note payment periods ranged from 3 to 10 months. The notes were issued by dealers either on the purchase date or after the sale was carried

as an accounts receivable for 10 to 120 days.

Credit Performance Measures

The average collection period on account sales was used as a measure of the average length of time a dollar of fertilizer sales was invested in accounts receivable. It was computed from the distribution of payments on accounts according to their age at the time of collection. The average observed collection period for dealers with account policies was 121 days. The observed range was from 32 to 280 days. The multiple linear regression analysis indicated that dealers who had shorter account due periods, offered cash discounts and offered note financing had significantly shorter average collection periods on account sales. If the finance charge rate was greater than 1 1/3 percent per month, the dealers who imposed finance charges had significantly shorter average collection periods than those that did not impose a finance charge. The cash discount rate was not as significant as whether or not a cash discount was offered in explaining changes in the average collection period. Also, the length of the cash discount period was not significant in explaining variation in the dealers' average collection periods.

The average observed percent of sales for cash and on account for dealers who offered financing was 25.29 and 65.04 percent, respectively. The multiple linear regression analysis indicated that credit policy variables offered by dealers explain part of the variation in the percent of sales for cash and on account. The dealers offering shorter account due periods had a significantly smaller percent of sales on account and larger percent of sales for cash. The dealers with both note and account financing available had a smaller percent of fertilizer

sales on accounts and for cash than dealers offering only account financing. However, the dealers with both account and note financing financed a larger percent of their fertilizer sales (including both accounts and notes) than dealers offering only account financing. Offering a cash discount for early payments reduced the percent of sales on accounts and increased the percent of sales for cash. However, the dealers with longer cash discount periods had a larger percent of sales on account and a smaller percent of sales for cash than dealers with shorter cash discount periods. Again, the cash discount rate was not as significant as whether or not the cash discount was offered in explaining variation in the percent of sales on account or for cash. Also, the finance charge variables did not have a statistically significant impact on the percent of sales on account or for cash. A firm characteristic variable, the dealer's annual fertilizer sales was significant in explaining variation in the percent of sales for cash and on account. The dealers with larger annual fertilizer sales had a larger percent of sales on account and a smaller percent of sales for cash than the dealers with smaller annual fertilizer sales.

Only two credit policy variables were significant in explaining the variation in the percent of fertilizer sales on notes. The average observed percent of fertilizer sales on notes for the dealers who offer note financing is approximately 23 percent. The dealers charging a higher interest rate or offering a shorter average note payment period had a significantly smaller percent of sales on notes.

Investment Costs

The receivable investment cost per dollar of fertilizer sales was

calculated for alternative account and note policies assuming the dealer's annual fertilizer sales was $170,000 and his annual cost of capital rate was 8 percent. The credit policy decision variables which were significant in reducing the average collection period and the percent of sales on accounts also reduced the accounts receivable investment cost. For dealers that offer only account financing, the smallest predicted accounts receivable investment cost per dollar of fertilizer sales was .51 cents. This cost resulted if the dealer had a 30-day account due period, a cash discount, and a 1.5 percent per month finance charge. With this policy, the dealer's estimated average collection period is approximately 48 days and the percent of sales on account was nearly 53 percent. In contrast, a 180-day account due period, a .5 percent per month finance charge rate and no cash discount resulted in the highest cost per dollar of fertilizer sales (4.20 cents) for account policies. For this policy, the estimated average collection period and percent of sales on account were 244 days and 78 percent, respectively.

The notes receivable investment costs per dollar of fertilizer sales for alternative note policies ranged from .08 cents to 3.08 cents. The note policy which resulted in the lowest investment cost had a 12 percent annual interest rate and a 4-month note payment period. With this policy, only 3 percent of the dealer's fertilizer sales were invested in notes receivable. The note policy yielding the highest investment cost had a zero rate of interest and an 8-month note payment period. The percent of sales on notes for this policy was nearly 58 percent.

Assuming the dealer's note policy has an 8 percent annual interest rate and a 6-month note payment period (the average note policy), the estimated combined receivables (accounts and notes) investment cost per dollar of sales was calculated for alternative account policies. The receivables investment cost per dollar of sales for dealers offering both accounts and notes ranged from 1.18 to 4.01 cents. These cost results were compared to the receivables investment costs for the dealers offering only account financing. For each alternative account policy with account due periods of 30, 60, or 90 days, the receivables investment costs per dollar of fertilizer sales were smaller for dealers offering only account financing than for dealers offering both accounts and notes. The costs were also less for dealers with only account financing if the account due period was 180 days, the finance charge rate was 1.0 or 1.5 percent per month and a cash discount was offered. The combination of account and note financing resulted in lower receivables investment costs if the account due period is 180 days and the finance charge rate is .5 percent per month.

The costs per dollar of sales for each alternative credit policy were higher when a higher cost of capital rate was used to calculate the costs. Also, the cost per dollar of sales was higher if the dealer's annual fertilizer sales was greater than $170,000, and lower if sales were below $170,000.

As indicated, a change to a less lenient credit policy could result in cost savings and an increased profit margin per dollar of sales. The effect of a change to a lower cost credit policy upon the dealer's sales was evaluated using a break-even analysis. Given a change to a lower cost credit policy, substantial sales reductions could occur

without decreasing the dealer's profit. The results depend upon the assumptions concerning the dealer's initial profit margin, sales level, and credit policy.

Conclusions and Implications

Methodological Issues

The results obtained for the receivables investment cost analysis are dependent upon the correct specification and measurement of the factors which affect the dealer's receivables investment cost. The investment cost results obtained also depend upon the accuracy of the estimated empirical relationship between the decision variables and the performance measures.

The dealer's annual cost of capital rate, the proportion of sales financed and the timing of payments for credit sales were specified as the determinants of the receivables investment cost. The proportion of the dealer's sales financed and the timing of payments for credit sales were dependent upon the dealer's credit policy variables. However, other factors not controlled by the dealer which have a theoretical impact on the customers' purchase and payment behavior were not observed. The farmer's personal and financial characteristics and the cost and availability of other sources of financing will likely have an important impact on the farmer's input purchase and payment decision. Also, due to the difficulty in quantifying their values, some of the credit policy decision variables suggested by theory were omitted from the empirical analysis. The dealer's collection practices and standards may have a substantial impact on the proportion of sales financed and the timing of collections.

The accuracy in the measurement of the credit policy decision variables also affects the results of the investment cost analysis. The data obtained from the questionnaires mailed to fertilizer dealers are subject to errors of observation and measurement. Some of the specified credit policy variables may not be enforced by the dealers. For example, dealers frequently may not collect finance charges on account sales not paid by the time specified in their credit policy. Also, cash discounts may be given to farmers who pay after the cash discount period specified in the dealer's credit policy.

Errors of observation or measurement may also be present in the credit performance variables. Some of the dealers could have reported the sales paid for within a few days after the purchase date as account sales. Thus, the observed values for the percent of sales financed with accounts may be under reported.

Only one parameter of the distribution of account sales paid after various lengths of time, the mean age of account sales at the time of collection, was utilized to measure the timing of payments for credit sales. However, computing the average collection period from the distribution of payments probably gives a more accurate measure of the dealer's collection experience than a more frequently used calculation. The ratio of the dollar value of receivables outstanding to the current average dollar volume of credit sales per day is probably most often used by dealers.

The accuracy of the values estimated for the receivables investment costs also depend upon the accuracy of the estimated empirical relationships between the credit policy variables and the credit performance measures. The multiple regression coefficients for the

selected models indicated that several credit policy variables significantly explain part of the variation in the dealers' average collection periods, percent of sales on accounts, percent of sales on notes, and percent of sales for cash. However, as indicated by the low R^2 values and the examination of the residuals, a large proportion of the variation in the credit performance measures was not explained by the credit policy decision variables. The examination of the residuals suggested that the small observed values for the credit performance measures are over predicted and the large observed values are under predicted. Thus, use of the predicted values in the investment cost equations likely yield estimated costs that have a narrower range than the actual range in investment costs.

The omission of some credit policy variables and other non-controllable variables which have a theoretical impact on the credit performance measures may have introduced some of the bias in the regression estimates. Also, errors of measurement and observation in significant credit policy variables may have introduced additional bias in the regression estimates.

Not all of the credit policy variables which were included in the regression analysis were statistically significant in explaining changes in the credit performance variables. The lack of statistical significance may be due to a high degree of linear dependence among some of the credit policy variables rather than to a weakness in the theory itself.

Receivables Management

This study of the impact of trade credit policies upon the magnitude of accounts and notes receivable and receivables investment costs has several implications for farm input dealers and their suppliers. The empirical results indicated that the fertilizer dealers' present account policies result in estimated average annual investments in accounts receivable ranging from $10,838 to $89,250 assuming annual fertilizer sales of $170,000. Assuming an annual cost of capital rate of 8 percent, the annual receivables investment costs for the dealer's credit policies would range from $867 to $7,140. For dealers with fertilizer sales larger than $170,000 and cost of capital rates higher than 8 percent, the investment costs are even greater. Depending upon who furnishes the funds for the receivables investment, this interest or opportunity cost is incurred by either the local fertilizer dealer or his supplier.

Based on the results of this study it is apparent that changing to a less lenient credit policy can substantially reduce the dealer's receivables investment cost per dollar of sales. Changes in selected credit policy decision variables were shown to be effective in reducing the proportion of fertilizer sales financed and the average number of days the financed sales are invested in receivables. Reductions in these credit performance measures will reduce the dealer's investment cost per dollar of sales.

The most important credit policy variable affecting the number of days account sales are invested in accounts receivable was the dealer's account due period. A change from a 180-day (crop harvest) to a 30-day account due period would result in an estimated 108-day decrease

in the dealer's average collection period. Offering a cash discount, imposing a higher finance charge rate, or offering note financing also significantly reduced the average collection period on accounts.

The credit policy variable which had the largest impact on the proportion of fertilizer sales invested in accounts receivable was the dealers cash discount policy. Offering a cash discount to customers for payments on the purchase date reduced the percent of fertilizer sales on account by over 16 percent. However, offering a cash discount for payments received within 20 days after the purchase date reduced the percent of sales on account by only 6 percent. Offering note financing also significantly reduced the percent of sales on accounts but the decrease is offset by an increase in the percent of sales on notes. Also, decreases in the length of the account due period reduced the percent of sales on accounts.

Although the direct impact of changes in the dealer's credit policy upon the dealer's annual fertilizer sales was not estimated, the break-even analysis indicated substantial sales reductions can occur without decreasing the dealer's profit. Changing from a 180-day to a 30-day account due period resulted in a cost savings of 2.16 cents per dollar of sales. Thus, assuming the dealer's initial annual fertilizer sales is $170,000, his initial profit margin is 5 cents per dollar of sales and his initial receivables investment cost is 3.69 cents per dollar of sales, the dealer's annual fertilizer sales could decrease by over $51,000 without changing his net profit.

Further Research

This study emphasized the importance of the determination of the

receivables investment cost for evaluating changes in the dealer's credit policy. Further theoretical and empirical analysis is needed to determine the impact of changes in the credit policy upon the dealer's revenue, other credit costs, and other operating costs.

A change in the dealer's credit terms will likely influence two components of the dealer's revenue--his rate of sales and his financial revenue. The impact of the dealer's credit policy upon the rate of sales would need to be distinguished from the effects of offering other services and other marketing decision variables. Elements of uncertainty concerning the reactions of both buyers and rival competitors to changes in credit policy would complicate the analysis. Probability distributions for the quantity of a farm input demanded by farmers estimated for alternative sets of credit terms would provide more information for decision making than a single estimated value.

Very little work has been done concerning the amount of revenue received by dealers from finance or interest charges collected on outstanding customer accounts and notes. Financial revenue collected from customers who pay accounts after the due date would off-set part of the additional cost of having the dealer's operating funds tied up in receivables for longer lengths of time.

Also, additional research effort is needed to determine the impact of alternative credit policies upon the other credit costs. The collection costs, bad debt losses and the value of cash discounts given, as well as the investment costs, are theoretically related to the length of time credit sales remain unpaid. To estimate these costs, distributions of the dealer's collections at various lengths of time under alternative credit policies similar to the distribution used to compute

the average collection period for this study would be useful. Using past payment performance experience, a probability distribution of collections could be estimated.

The impact of changes in credit policy and changes in the dealer's rate of sales brought about by a change in credit policy upon the dealer's other operating costs also needs to be investigated. For a complete analysis of the effect of alternative credit policies on the dealer's profit, the impact of the credit decision on other managerial decisions such as the optimum inventory policy should also be considered.

The theoretical analysis of this study stressed the importance of the impact of credit policy variables on the buyer's purchase and payment behavior. Additional theoretical and empirical inquiries concerning the impact of the farmers' personal characteristics and financial success upon his purchase and payment decisions would provide useful information for future studies of receivables management. First, to develop probability distributions for both sales and collections, data concerning the farmers' past purchase and payment experience under alternative conditions is essential. Second, the relationship between the farmer's personal and financial traits and his payment performance would provide useful data for studies which deal with the screening of credit customers and credit line determination.

The average collection period on account sales was used as a means to evaluate and compare the length of time funds are invested in receivables for alternative credit policies. The average collection period and other computed ratios and indices are often used to monitor the investment in receivables. A recent study[1] suggests that most of

the procedures used to monitor receivables including the average collection period and the aging of collections are misleading and subject to errors. An alternative method is suggested. An empirical comparison and evaluation of alternative receivables monitoring devices is needed. The use of the alternative procedures should be tested under alternative sales and collection conditions.

Finally, this study has not considered the legal aspects of credit policies. The recent changes in the law dealing with credit policy disclosure and restrictions on finance charge rates have important implications for credit policy decisions. Additional research effort would provide important information for farm input firm managers.

FOOTNOTES

[1]Wilbur O. Lewellen and Robert W. Johnston, "Better Way to Monitor Accounts Receivable", Harvard Business Review (May-June, 1972), pp. 101-109.

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APPENDIX A

THE QUESTIONNAIRE

To obtain data concerning the dealers' credit policies and credit performance, the following questionnaire was mailed to Oklahoma farm input dealers during March, 1971. The questionnaire was sent to all dealers who sell dry bulk or liquid fertilizer to farmers.

CONFIDENTIAL

CREDIT POLICY QUESTIONNAIRE FOR FERTILIZER DEALERS

A. General Characteristics of Your Firm.

1. Indicate by checking the appropriate blank what type of firm you operate.

   ___ Cooperative
   ___ Independent dealer
   ___ Company Store (owned by fertilizer supplier)
   ___ Lease-Agent Operation (lease facilities from fertilizer supplier)
   ___ Other (specify) _____

2. What was your total dollar sales of all products and services from all operations during the last fiscal year? $_____
   Specify your fiscal year _____

3. What was your total dollar sales from fertilizer and services associated with the sale of fertilizer to farmers during the last fiscal year. $_____ If you cannot estimate the dollar sales of fertilizer, approximately what percent of your total dollar sales of all products (question 2) does fertilizer represent? _____%

4. What services were offered to farmers who bought fertilizer during the last fiscal year? Check the column on the left if the service was offered. Check in columns on the right if the service was offered with a charge or at no charge to the buyer.

Offered	Service	Charge	No Charge
	Applicator Furnished		
	Complete Custom Application		
	Fertilizer Delivery Service		
	Loading after Hours or on Sunday		
	Special Field Help		
	Soil Testing		
	Educational Meetings		
	Farm Planning Programs		
xxx	Other Services (specify below)	xxx	xxx

B. The following questions refer to your credit arrangements offered to farmers who buy fertilizer. Answer each question considering only fertilizer sales during the last fiscal year.

1. Why were credit terms offered to farmers by your firm or fertilizer supplier? Rank (1st, 2nd, 3rd, 4th, 5th, etc.) the following reasons for offering credit terms.

Rank	Reason
____	To maintain or increase your market share of sales.
____	To increase net profit.
____	To make money on finance charges.
____	Convenience to buyers.
____	To increase fertilizer sales in the off season.
	Other reasons (specify)
____	_____
____	_____

2. What has happened to your firm's net profit due to selling fertilizer on credit? Check appropriate answer and give reasons.

____ Increased net profit of the firm.
____ Decreased net profit of the firm.
____ Had relatively little effect on net profit of the firm.
Reasons: _____

_____

3. Approximately what percent of your total fertilizer sales during the last fiscal year was sold with each of the following terms?

_____% sold for cash at the time of purchase or delivery.
_____% sold on credit on your firm's open account.
_____% sold on credit on the fertilizer supplier's open account.
_____% sold on credit with a promissory note held by your firm.
_____% sold with a promissory note held by the fertilizer supplier.
_____% sold with a promissory note held by local bank.
_____% sold with some other type of credit arrangement (specify)
_____.

4. If cash discounts (not volume discounts) were offered for payments made at the time of purchase or within a specified number of days after the purchase, indicate the percent cash discount offered with each of the following terms.

_____% cash discount was offered for payment made on the day of purchase or delivery.
_____% cash discount was offered for payment made within 30 days from date of sale.
_____% cash discount was offered for payment made within ____ days (indicate other times not stated above) from date of sale.

5. If fertilizer sales are made on your firm's or the fertilizer supplier's open account, answer questions 5a, 5b, and 5c. If not, go to question 6.

   a. What percent of fertilizer sales made on open account are due in the following time intervals.

      _____% due within 30 days from date of sale.
      _____% due from 30 to 90 days from date of sale.
      _____% due at time of crop harvest.
      _____% due at some other time (specify). _____

   b. What percent of fertilizer sales made on open account are paid in the following time intervals? Estimate from past experience with your customers payment practices.

      _____% are paid within 30 days from date of sale.
      _____% are paid from 30 to 90 days from date of sale.
      _____% are paid from 90 days to six months from date of sale.
      _____% are paid from six months to one year from date of sale.
      _____% are paid after one year from date of sale.
      _____% are not paid or are written off as a bad debt.

   c. If there are finance charges on open accounts, indicate the monthly rate and when it goes into effect.

      _____% per month is charged on accounts not paid within _____ days from date of sale.

6. If promissory notes were issued by your firm or the fertilizer supplier to finance your fertilizer sales to farmers, answer questions 6a, 6b, and 6c.

   a. What annual percentage rate is charged on promissory notes?

      _____% is charged on notes held by your firm.
      _____% is charged on notes held by the fertilizer supplier.

   b. At what time are most promissory notes issued? Check appropriate answer.

      _____ on the date of sale.
      _____ after the sale has been carried on an open account for approximately _____ days.

   c. What is the average number of months the promissory notes are outstanding?

      Notes held by your firm are outstanding for approximately _____ months.
      Notes held by the fertilizer supplier are outstanding for approximately _____ months.

7. Check which of the following statements are required of new customers.

__ Formal credit application.
__ Financial statement.
__ Some other statement regarding the financial condition of the buyer. (Specify).

_____

__ No formal application or statement.

8. Check the types of collection practices your firm uses to collect payments of accounts or notes.

__ Written notices once a month.
__ Written notices when account is due.
__ Personal visits after account is due.
__ Other means of collection (specify).

_____

9. Please make any additional remarks about your credit arrangements. Also, indicate if credit terms are different than those previously stated for different types of fertilizer.

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B

TABLES

Tables XLII, XLIII, and XLIV illustrate the estimated values for the average collection periods, percents on account and percents for cash for dealers who offer both account and note financing. The sums of the percent cash, percent account, and percent note deviate substantially from 100 percent for all account policies when the annual interest rate on notes and the note payment period is different than 8 percent and 6 months, respectively. The sums of the estimated percent of sales financed and the estimated percent of sales for cash for alternative account and note policies are summarized in Table XLV.

TABLE XLII

ESTIMATED AVERAGE COLLECTION PERIOD ON ACCOUNTS RECEIVABLE FOR SELECTED ACCOUNT-NOTE POLICIES (NO FINANCE CHARGE)

Account Due Period	No Cash Discount	Cash Discount Offered
	(days)	(days)
30 days	66.00	37.54
60 days	87.69	59.23
90 days	109.38	80.92
180 days	177.45	145.99

TABLE XLIII

ESTIMATED AVERAGE COLLECTION PERIOD ON ACCOUNTS RECEIVABLE FOR SELECTED ACCOUNT-NOTE POLICIES (WITH FINANCE CHARGE)

Finance Charge Period and Rate	No Cash Discount	Cash Discount Offered
	(days)	(days)
30 days		
.5%	114.96	86.50
1.0%	85.50	40.24
1.5%	55.00	27.57
60 days		
.5%	136.65	108.19
1.0%	107.19	78.73
1.5%	77.72	49.26
90 days		
.5%	158.34	129.88
1.0%	128.88	100.41
1.5%	99.41	70.95
180 days		
.5%	223.41	194.95
1.0%	193.95	165.48
1.5%	164.48	136.02

TABLE XLIV

ESTIMATED PERCENT OF FERTILIZER SALES FOR CASH AND ON ACCOUNTS FOR SELECTED ACCOUNT-NOTE POLICIES, $170,000 FERTILIZER SALES

Finance Charge Period or Account Due Period	No Cash Discount	Cash Discount Period			
		Purchase Date	10 Days	20 Days	30 Days
		(Percent of fertilizer sales)			
30 days					
Account	52.75	36.81	41.86	46.90	51.95
Cash	21.04	37.65	32.30	26.94	21.59
60 days					
Account	54.66	38.72	43.77	48.82	53.86
Cash	19.41	35.99	30.67	25.31	19.96
90 days					
Account	56.57	40.63	45.68	50.73	55.77
Cash	17.78	34.36	29.04	23.69	18.33
180 days					
Account	62.30	46.37	51.41	56.46	61.51
Cash	12.89	29.47	24.15	18.80	13.44

TABLE XLV

ESTIMATED SUM OF PERCENT OF FERTILIZER SALES ON ACCOUNTS, ON NOTES AND FOR CASH FOR SELECTED ACCOUNT-NOTE POLICIES, $170,000 FERTILIZER SALES

Account Policy	Note Policy[a]								
	0 Percent 4 Months	0 Percent 6 Months	0 Percent 8 Months	8 Percent 4 Months	8 Percent 6 Months	8 Percent 8 Months	12 Percent 4 Months	12 Percent 6 Months	12 Percent 8 Months
	(Sum of the Percent of Sales on Account, on Notes, and for Cash)								
30-Day Account Due Period No Cash Discount	115.47	123.67	131.61	89.79	97.73	105.67	76.82	84.75	92.70
30-Day Account Due Period Cash Discount on Purchase Date	116.40	124.44	132.28	90.46	98.40	106.34	77.49	85.42	93.37
90-Day Account Due Period Cash Discount Within 10 Days	116.66	124.60	132.54	90.72	98.66	106.60	77.75	85.68	93.63
180-Day Account Due Period Cash Discount on Purchase Date	117.78	125.72	133.66	91.84	99.79	107.72	78.87	86.80	94.75

[a]Note policies include the annual interest rate (%) and the note payment period (months).

VITA

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