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Doctor of Philosophy degree in Agricultural Economics

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AN ECONOMIC ANALYSIS OF CREDIT RESERVE MANAGEMENT BY PROPRIETARY FIRMS UNDER UNCERTAINTY
Volume I

By

William George Burghardt

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1989

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ABSTRACT

AN ECONOMIC ANALYSIS OF CREDIT RESERVE MANAGEMENT BY PROPRIETARY FIRMS UNDER UNCERTAINTY

By

William George Burghardt

Managing a firm's credit reserve and evaluating its impact on financial, capital investment and operational decisions becomes increasingly difficult during periods of financial stress. This study responds to the need for an expanded theoretical framework to predict and understand a firm's financial management under risk and stress.

Three investment models are developed to summarize the interrelationships between a firm's credit reserves, the firm's borrowing behavior under conditions of financial stress, and capital investment under imperfect capital market conditions. In each model, the risk averse decision maker manages his debt to maximize his expected utility of end-of-period wealth.

The first two models assume the firm has one category of risky assets and debt. Assets are divisible durables that last more than one period, and are purchased and sold in any quantity. Imperfect capital markets introduces a liquidity

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premium variable, which differentiates between an asset's acquisition and sale price.

The first model incorporates the possibility of bankruptcy. This is accomplished by defining an outcome point, which, if realized, results in bankruptcy and the loss of the firm's equity. This model shows the important interaction between the stochastic earnings of the firm, the need to balance cash flows, and credit extended by the lender.

The second model introduces the influence of a lender's credit policy. This is accomplished by introducing two credit policy variables that are determined by the lender. These include the liquidity premium variable, and a credit-worthiness variable. The possibility of restricted credit requires the decision maker to evaluate the potential economic consequences that his financial management decisions will have in view of forced asset liquidation.

The third model combines the features of the first two models and computer simulation techniques to expand the number of asset and liability categories for the firm, along with production, marketing and risk management strategies for a corn and soybean farm. The simulation model is used to evaluate six scenarios, based on different assumptions involving nominal interest rates, various lender credit policies, and increased yield and price risk. The analysis identifies the relative impact each of these factors has on the end-of-period wealth position of the decision maker.

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1989

To my
Linda's
made

DEDICATION

To my wife, Linda and son Bill.
Linda's constant support and love
made this project a reality.

No dissertation i
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many that contributed
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tributed a great deal
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and Gerald Schwab
Economics and Dr. Ron

The author wis
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willingness to share
pensable, contributi
this manuscript and
and economist.

During my gradu
have had the pleasur

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CHAPTER 1

INTRODUCTION: WHY DOES A PROPRIETARY FIRM NEED TO MANAGE ITS CREDIT RESERVE?

1.1 Background

Management of a farm firm's credit reserve and its impact on the firm's financial, capital investment and operational decisions have taken on increased importance during the 1980s. This has in part been the result of the most severe and widespread economic recession in agriculture since the 1930s. A number of general and agricultural economic factors have contributed to the farm sector's increased financial instability. A factor specific to the agricultural sector is increased product price variability, especially for grain commodities traded in the international market. A combination of the strength of the U.S. dollar and renewed emphasis by the federal government on 'free trade' and reduced government involvement in the U.S. Department of Agriculture's (USDA) farm programs, which were designed to reduce price and income uncertainty for agricultural producers, have contributed to increased commodity price variability.

A general economic factor that has contributed to increased financial risk to the agricultural sector has been the unprecedented increase in, and volatility of, interest

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rates in the financial markets. A combination of monetary policy changes by the Federal Reserve Board continued deregulation of the U.S. banking industry have significantly influenced the cost and availability of financial capital to agricultural producers.

While financial institutions serving agriculture have always had to manage risk, credit risk -- the risk from potential delinquency or default by borrowers -- has increased significantly during the 1980s. Higher credit risk can increase a lender's cost of funds and provide the basis for subsequent regulatory responses, which can influence the availability and cost of loan funds (Barry and Lee). Barry and Lee state further that financial intermediaries attempt to manage their total risk in a number of ways, including: pricing loans with higher risk premiums to compensate for various sources and levels of borrower risk, pricing loans with variable interest rates to pass on the bank's cost of funding risk to their borrowers, utilizing loan insurance and government loan guarantees to reduce credit risk, using non-price loan agreement provisions, including differences in loan limits, collateral requirements, borrower counseling, improved loan documentation and increased supervision, and avoiding high risk loans.

In summary, a combination of these factors, including, higher and more volatile interest rates, increased use of non-price factors in loan agreements, increased variation in net cash income before tax, and significant capital losses

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resulting from the protracted decline in farm real estate values have contributed to increasing financial risk for farmers in general, and for highly leveraged farmers in particular.

As a result of these changing economic factors, farmers need to understand how risk will affect their businesses. Farmers need more sophisticated tools for managing their resources during this period of increased financial risk. This study introduces two deductive investment models which examine the issues of financial stress, liquidity, credit management, and investment under risk for proprietary agricultural firms. The first, and by design less complex, deductive model will be used to present the theoretical relationships that have been incorporated into the second model, a more complete empirical computer simulation model.

The issues, which the deductive and empirical models are designed to address, can be introduced succinctly with the aid of a simple graph, as shown in Figure 1-1. Consider two different kinds of debt free firms. The first firm, the financially secure firm with a safe but low yielding asset mix, could guarantee a positive net cash flow without having to resort to borrowing money or investing in risky assets. As a result of the firm's positive cash flow position and decision not to use financial leverage, the firm's probability of bankruptcy would be zero, Pr(bankruptcy)=0.

If the firm exercised its option to invest in higher yielding yet risky assets, the lack of adequate internal

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resources would necessitate borrowing capital to acquire the additional assets. Through the combination of the stochastic nature of the risky investments and the financial leverage effect caused by the increased use of borrowed capital, the firm would be faced with an increased probability of bankruptcy (see Figure 1-1). Bankruptcy occurs when the firm fails to meet its cash flow obligations. This will be true only when cash flows are negative and the firm can no longer borrow or liquidate unsecured assets.

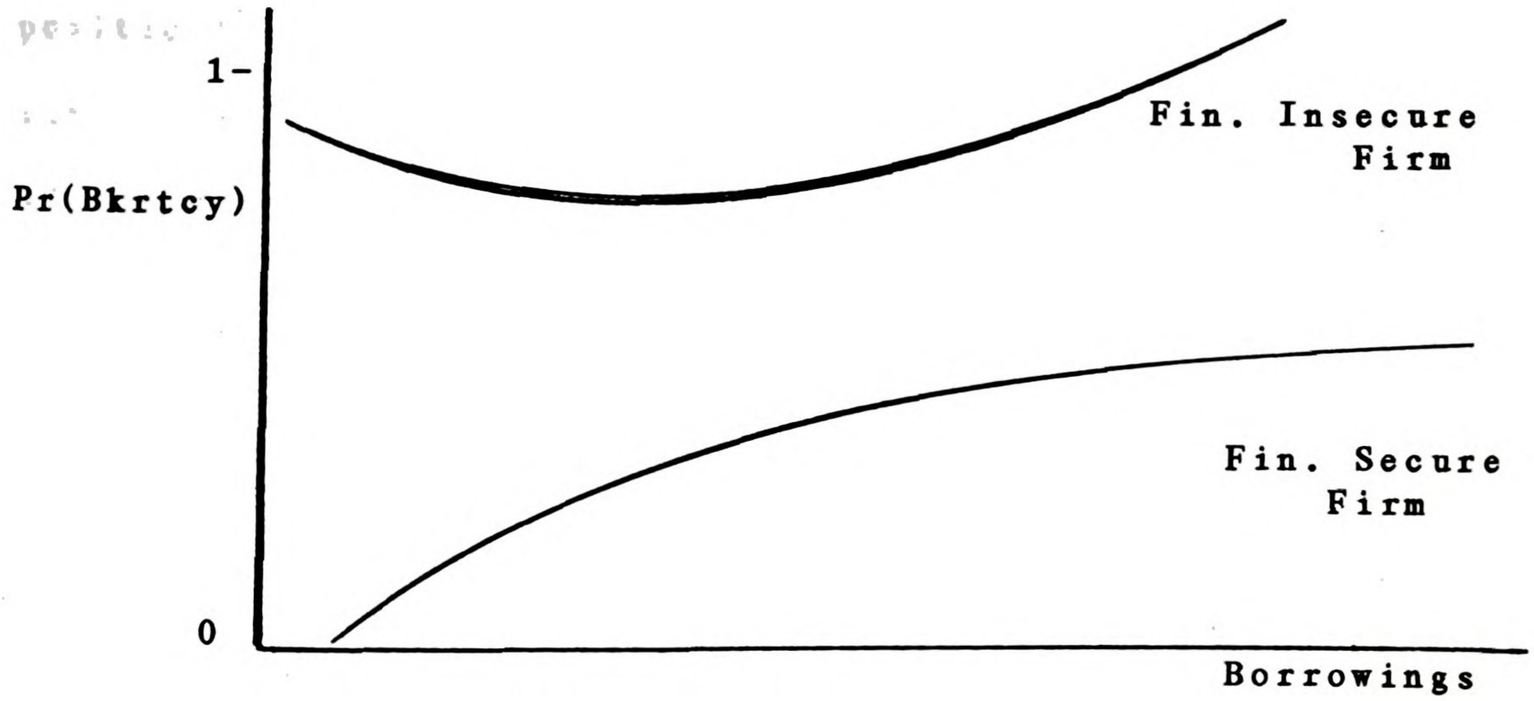

Figure 1-1 The Alternative Effects on the Probability of Bankruptcy of Increased Borrowings Depending on the Equity and Exogenous Cash Withdrawal Requirements of the Firm

Just the opposite relationship would be true for a financially insecure firm faced with a continuing deficit cash flow position. If the financially insecure firm's entire equity were invested in a safe investment alternative and no funds were borrowed, some portion of the firm's asset

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holdings would have to be liquidated to meet its cash flow requirements. If the firm maintained its investment in safe assets and continued to experience a deficit cash flow, the probability of eventual bankruptcy would be assured, Pr(bankruptcy)=1. If Pr(bankruptcy)=1, then no additional borrowing is possible. This relationship is also illustrated in Figure 1-1. Therefore, two quite different economic incentives exist for firms to increase their use of debt capital, with both incentives depending on the firm's equity position and cash withdrawal requirements (net cash flow position). In the case of the financially secure firm, increasing the amount of funds borrowed for the acquisition of risky assets would heighten the firm's potential rate of return and its probability of bankruptcy. In the case of the financially insecure firm, however, increasing borrowings to cover a deficit cash flow position and acquisition of additional risky assets would reduce the firm's probability of bankruptcy -- at least initially.[1]

Recent advancements in risk theory and measurement techniques have made it possible for researchers to account more accurately for attitudes toward risk in the actions of agricultural decision makers (Meyers, Barry and Fraser, King, Patrick, Whitaker and Blake, King and Robison, Robison, Robison and Lev, Love). Application of the improved

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1. It is assumed that the net rate of return on the acquired risky assets before interest expense will exceed the cost of borrowing and, thus, contribute to improving the firm's cash flow position.

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risk measurement techniques and research findings from these studies have enabled researchers to enrich their study of more sophisticated financial management and optimal debt usage strategies for agricultural decision makers facing uncertainty.

Many complex questions remain to be answered regarding how farmers' attitudes and level of risk aversion may vary with changes in wealth, risk and other sources of well-being (Barry). Barry stated further, that to be able to capture the joint effects of asset and liability management under conditions of risk and imperfect capital markets would enrich the conceptual foundation for modeling the financial management of farm businesses and would provide implications for policy analysis at both the micro and macro levels.

Although recent research has extended financial theory under risk to account for borrowing behavior under conditions of financial stress, the analysis conducted was a comparative static analysis (Robison, Barry and Burghardt). As a result, the analysis was unable to evaluate the simultaneous effects that increased debt usage had on all of the firm's financial variables. This study will address a number of the remaining issues associated with the management of credit reserves as a source of liquidity for a farm firm under financial stress. Through dynamic modeling of the financial components and behavior of a cash grain farm, the study will attempt to provide insight into the role of credit reserves and borrowing under uncertainty.

1.2 Research Objectiv

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1.2 Research Objectives

The analysis of borrower behavior with regard to optimal debt usage and credit reserve management under various credit policies, rules, and practices represents a critically important component in the evaluation of investment decisions and liquidity management by proprietary firms under risk. The deductive and empirical analyses presented in this study provide a comprehensive understanding of how risk averse decision makers and their lenders are likely to react to an increasing probability of bankruptcy. This study is oriented toward an assessment of liquidity management and optimal debt usage in response to alternative credit policies. This research orientation has yielded the following set of objectives:

1. To develop deductive investment models which examine the issues of financial stress, liquidity, credit management, and capital investment under risk for proprietary firms.

2. To formulate mathematical models that can be used to present the theoretical relationships between the farm firm and the credit institutions.

3. To construct a simulation model consistent with the above theoretical models to evaluate the financial performance of a Midwest corn/soybean farm firm over time under various lending policies and practices using alternative production, insurance, and investment strategies.

1.3 Research Methodo

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1.3 Research Methodology

This research study is problem-solving in nature and utilizes deductive reasoning. The study presents a rigorously defined analytic investment model that explores, in detail, the interrelationships between credit reserves, asset liquidation costs, the decison maker's wealth positions, and the cash requirements of the firm. This theoretical model is required to pass the tests of coherence -- theoretical internal consistency, and correspondence -- evaluation for external consistency. These tests require that the conclusions follow from the assumptions and propositions advanced, and that the results obtained from the model agree with applied decision environment experience regarding financial and risk management for proprietary firms and credit policies for agricultural lenders. Further, the simulation model will provide the capability to test for the theory of clarity -- the absence of ambiguity in the concepts and statements being tested. Finally, though no specific prescriptions are presented, the conclusions which result should pass the test of workability if the implied actions were to be taken.

1.4 Analytical Framework

An evaluation of firm level agricultural credit management and the impact of lender's credit criteria and policies on credit usage could be analyzed with the use of two possible research methodologies. Pederson identified these two

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methods as collection and analysis of firm-specific time series data from a number of similar firms, and development of a synthetic analytical approach that is theoretically consistent.

The first method would involve collection of actual financial data from individual farm firms over a number of years. Then, comparison of the performance of the individual firms with regard to income and net worth positions would be conducted. Pederson noted that this approach assumes that the individual firms have identical goals and objectives. This approach has a number of obvious practical and theoretical limitations, not the least of which includes a lack of comprehensive firm-specific time series data and the theoretical difficulties involved with aggregating the financial performance of various decision makers without detailed knowledge of their risk preferences.

The second method, which 'potentially yields greater insights into credit policy' and, therefore, subsequent credit usage, involves the use of synthetic modeling of the theoretical financial decision making process. Pederson states that this approach permits researchers to consider different assumptions regarding the firm's initial resource positions, production-investment opportunities, and consumption behavior under various credit policies in a controlled environment. Application of internally consistent synthetic methodology first requires the development of theoretical deductive models.

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In order to simulate alternative financial strategies for the purpose of evaluating such firm-specific activities as production, capital investment, credit usage and risk management, Barry and Brake suggest the use of a cash flow approach. Pederson noted Barry and Brake's assertion that a cash flow approach is instrumental for analyzing the productivity of resources and the liquidity position of the firm over time. The authors state further that 'cash flow analysis aids in evaluating the impact of both alternative investment choices and alternative financing strategies used in acquiring resources on liquidity position, income expecations, and the present worth of the firm.' Pederson stated that the modified cash flow approach at the firm level is comparable to the sources and uses of funds accounting statement.[2] This study uses the modified cash flow approach. Its use is discussed with regard to the theoretical model in chapter 3, with greater detail presented in chapter 5, where details of the simulation model are presented.

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2. The sources and uses of funds statement accounts for flows of cash into and from the farm business and serves as a means for going from one balance sheet to a subsequent one (Pederson).

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The remainder of this report is organized as follows. Chapter 2 provides a selective review of the literature in the areas of liquidity, credit and credit reserve management, credit rationing theory, practical and optimal leverage, and a review of efforts to model firm level borrowing behavior.

Chapter 3 presents the first of two theoretical deductive investment models which examine the issues of financial stress, liquidity and credit management, and investment under risk for proprietary agricultural firms. The first, and by design less complex model of the firm incorporates both credit reserve management and the probability of bankruptcy into the decision maker's expected utility objective function. The firm's credit reserve is calculated by using a theoretical maximum credit reserve expression. An imperfect capital market is assumed in the model, which results in the introduction of a liquidity premium due to asset illiquidity. In this first model, credit serves as both a liquidity buffer against adverse cash flow outcomes and as the only source of capital for the acquisition of additional risky assets.

A second, more complex model is introduced in Chapter 4. It expands on the theoretical properties of the initial model through the introduction of a restricted credit reserve expression. In addition to considering the probability of bankruptcy, this model requires the decision maker to

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decide the optimal debt level for the firm knowing of the availability of voluntary and forced asset liquidation for managing the firm's restricted credit reserve.

Chapter 5 presents a credit reserve management simulation model, which incorporates and expands on the theoretical-mathematical relationships contained in the first two models. The computer simulation model significantly expands on the credit reserve theory of the firm presented in chapters 3 and 4 by incorporating crop production, marketing, risk management and investment strategies for a typical Midwest corn/soybean cash grain farm.

Chapter 6 presents the data sources for the simulation model. Enterprise crop budgets, the methodology used to develop random commodity prices and yields, land valuation, and the parameters of acquiring additional tillable acreage are presented. Macro economic data are presented, including the expected annual inflation rate and select agricultural interest rates for the planning period.

Chapter 7 provides an analysis of the economic impact of alternative credit policy assumptions on the typical Midwest corn/soybean grain farm based on different initial physical and financial resources. The computer model is used to simulate the intertemporal impact of the various credit policy assumptions on the end-of-period wealth position for grain farms with varying resources under different production, pricing, marketing, and inflation assumptions.

Chapter 8 pres

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Chapter 8 presents a brief summary of the primary research results and conclusions concerning management of credit reserves for farm firms facing uncertainity.

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2.1 Introduction

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CHAPTER 2

A SELECTIVE REVIEW OF THE LITERATURE

2.1 Introduction

> 'For more than a decade, the financial experience of the agricultural sector has been dominated first by the advent, and then by the after effects, of a farm boom of major proportions.'
>
> (Emanuel Melichar, 1980)

With the tremendous increase in the price of most agricultural commodities during the mid-1970s and the accompanying rapid increase in asset values, farmers' historically conservative attitudes toward the use of debt changed dramatically. Those farmers willing to borrow more freely experienced rapid growth in their wealth position as a result of increased use of financial leverage. The end of the agricultural boom in 1980 and the subsequent protracted recession taught lenders and agricultural producers that they needed to understand better how to manage a firm's total risk, and, in particular, the firm's financial risk.

Financial risk is defined as the added variability of the net cash flows of the owners of equity capital that results from the fixed financial obligations associated with debt financing and cash leasing (Barges). Gabriel extended this definition to include the risk of being unable to meet

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prior claims with the cash generated by the firm, which is determined by the dispersion of net cash flows and the level of fixed obligations, as well as the firm's pool of liquid resources. A firm's financial risk increases as a result of expanded use of financial leverage and developments in the national financial markets. Strategies for managing a firm's liquidity and, in particular, the firm's credit reserve have taken on increased importance for decision makers during the 1980s.

This chapter begins with a review of the fundamental concept of liquidity and how the existence of an imperfect capital market influences liquidity management for a risk averse decision maker. Next, the term 'credit' is defined, the benefits and costs of credit and credit reserves are reviewed, and recent research involving credit policies and credit reserve management is discussed. Credit rationing -- both internal and external to the firm -- is then examined, along with a discussion of optimal financial leverage from both the firm's and lender's perspective.

The next section reviews research dealing with models of farm level borrowing behavior. Finally, the chapter's summary discusses the key features of credit reserve management and optimal debt usage. These will serve as the framework for constructing a firm level deductive model of credit reserve management for a firm facing uncertainty.

2.2 Liquidity and As

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2.2 Liquidity and Asset Liquidation Costs

Liquidity refers to the ability of the firm to generate cash in order to meet cash demands as they occur and to provide cash for unanticipated events (Barry, Hopkin, and Baker). Unanticipated events can include new investment opportunities or adversities, such as a crop failure, that will result in economic losses and, thus, make it difficult for the firm to meet scheduled cash demands. Barry, Hopkin, and Baker also point out that 'a firm's need for liquidity is closely tied to its (total) risk position, and that the occurrence of risks (business and financial) cause the need for liquidity.' Baker, among others, emphasizes the importance of liquidity management in managing business and financial risk for farm operations (Baker and Hopkin, Barry and Baker; Gabriel).

Gabriel points out that liquidity reserves exert no explicit effect on the variability of income or cash flows. Rather, the influence is implicit in that liquidity reserves affect the production and financial organization of the firm. Barry, Baker, and Sanint note that liquidity management is the principle means by which crop farmers cope with variations in cash flows that arise from uncertain commodity prices, yields, and production costs. Variability in a farmer's scheduled interest payments is the result of a lender's increased use of variable interest rate loan programs.

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Barry, Baker, and Sanint state that 'liquidity concepts are based on relationships between a firm's composite value of assets and the cash proceeds expected from each asset's sale to meet liquidity needs.' An asset is considered 'perfectly' liquid if its sale generates cash equal to or greater than the reduction in the value of the firm resulting from the sale (Baker). A number of factors influence an asset's liquidity, including transaction costs, marketability, time allowed for liquidation, liquidity risk, and the asset's impact on the firm's capital integrity (Barry, Baker, and Sanint; Burghardt and Robison).

Because most agricultural firms maintain a small cash reserve relative to total assets or total production costs, the firm's easy access to credit has become its principle source of liquidity. Research has shown that farmers, especially risk averse decision makers, use their available credit as a management resource in responding to production and financial risk (Barry, Hopkin, and Baker).

2.3 Credit: Concept
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2.3 Credit: Concepts and Management of the Firm's Credit Reserve

The origin of the word credit is from the Latin word 'credo' meaning 'I believe' and thus, is based upon confidence between parties (Lee, et al.). Barry, Hopkin, and Baker define credit as a firm's capacity to borrow. While the words 'credit' and 'borrow' often are used interchangeably, they have different meanings, according to Lee, et al. The term 'borrow' is defined as the firm's ability to command capital or services today based on a promise to repay the capital or to pay for the service at some future date. Hence, a firm's credit reserve or borrowing capacity represents an intangible resource, which a decision maker can use either now or in the future.

Pederson summarizes four benefits that borrowers receive from using credit, including:

> 'First, the borrower gains the limited right to purchase additional assets or to otherwise invest the loan proceeds within the limits specified in the loan contract. Included are the rights to reallocate resources within the firm, to purchase needed productive inputs, or to invest the loan proceeds for business purposes subject to any restrictive covenants specified by the lender in granting the credit.
>
> The second benefit is the right to income from such assets and investments, or from related productivity increases above debt service costs, which come from the credit. This includes rights to future income from reinvestment of savings accomplished by the original purchase or investment. Therefore, one must consider the dynamic nature of investing, paying debt service costs, generating savings, and reinvesting the earnings to generate additional income. ..... Further, it suggests that debt service is an influential factor affecting cumulative benefits in that repayment terms will

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The third benefit is the right to appreciation or depreciation of assets or investments so long as the terms of the loan are met. In an inflationary situation this right can have particular importance in terms of the capital gains or appreciation accruing to some investments as well as for depreciation write-offs, investment credit and other possible tax advantages.

The fourth benefit is the right to sell, lease, collateralize or otherwise use the property acquired with credit subject to loan repayment terms. This is to say that one can realize a profit on the sale of the item purchased by credit, and that profit accrues to the owner rather than to the lending institution as long as loan terms are met. Such capital gains are conceived as separate from the income produced by use of the asset.'

In addition to the benefits that accrue from having access to credit, Pederson also identifies three real or potential costs to the firm associated with the use of credit. These costs include the interest cost (and related transaction fees) for the use of borrowed funds, a potential cost resulting from the increased financial risk associated with a higher leverage position (higher debt/asset ratio), and the risk of loss of future access to credit. Barry, Baker, and Sanint highlight this cost: as borrowing activity increases the farmer's remaining credit (reserve) will become more volatile in response to changes in asset values and income expectations.

More specifically, depending on the type of financial market, the benefit to holding credit as a liquidity reserve is that it can be an efficient and cost effective way to provide liquidity to the firm compared to holding many other

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types of assets. If it is assumed that the financial market is perfect, then the firm's credit reserve plays a minor role as a liquidity buffer. On the other hand, if the market is imperfect, the firm's credit reserve assumes a more important role in liquidity management (Burghardt and Robison). According to Robison and Barry, a major advantage of using credit is that credit does not disturb a firm's basic asset structure or production organization since no asset liquidation occurs, transaction costs involving credit are relatively low, institutional sources of loan funds are widely available throughout financial markets, and credit has a high degree of flexibility since loan funds can be channeled to numerous uses.

As discussed for credit in general, there are costs to the firm for establishing, maintaining, and borrowing from a credit reserve. Maintaining a credit reserve eliminates potential returns from foregone investment opportunities from further financial leverage, interest must be paid when loans are made, noninterest charges -- such as deposit balances and loan fees -- sometimes are required to compensate lenders for establishing lines of credit, future cost and availability of credit are uncertain, financial flexibility is lost as the firm's assets become subject to collateral claims of lenders, and considerable financial control may shift to the firm's lenders (Robison and Barry).

In summary, the primary benefit to a firm associated with maintaining a credit reserve is the accessibility of

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cash, the most liquid of assets, in order to meet cash flow deficits (Sonka, Dixon and Jones). Therefore, the decision by the firm's management to maintain a credit reserve represents the observance of risk averse behavior on the part of the decision maker in response to possible economic uncertainty (Barry and Baker). Kadlec and Jones conclude that increased reliance on accessibility to an adequate credit reserve represents the expected behavior of risk averse decision makers during periods of increased economic uncertainty. Empirical evidence and observation indicate that for risk averse farmers, credit reserves play a vital role in being able to respond to business and financial risks (Barry, Hopkin, and Baker; Barry and Baker; Sanint).

Barry and Baker observe that for a specific firm, a quantitative expression for the firm's credit reserve can be described as the difference between a firm's total debt capital limit as determined by external credit rationing, and the amount of credit actually used by the decision maker. To quantify a firm's credit reserve in this manner implies that both parties are involved in determining the size of the credit reserve (Sonka, Dixon, and Jones). Thus, the first party, the lender, decides upon the level of external credit rationing while the second party, the decision maker, decides how much of the credit to utilize.

A farmer's reliance on his or her firm's credit reserve as a source of liquidity introduces an additional risk to the decision maker: trying to anticipate how the firm's

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lenders will respond to changing economic conditions. Robison and Barry pointed out that both macroeconomic and microeconomic factors influence a firm's availability of credit. The authors state that prevailing macroeconomic conditions in the general economy during the late 1970's contributed to the need to change monetary and fiscal policies. Furthermore, structural and regulatory characteristics of financial markets and aggregate economic performance may influence the cost and supply of loan funds, as may the microeconomic conditions that affect financial intermediaries. Other credit determinants originate in the agricultural sector for specific firms based on the supply/demand conditions for products and resources. Finally, there are microeconomic credit determinants that involve factors related to the performance and credit worthiness of the individual farm firm. Robison and Barry point out that poor performance by a firm may reduce its access to credit at the very time that the firm's prospects for survival are diminished. Just as a firm's assets are deteriorating in value and quantity as a result of operational losses, so the firm's available credit reserve deteriorates. The reduced credit reserve results from the firm's lenders re-evaluating the firm's end-of-period asset and debt characteristics and net cash flow position as sources of collateral and repayment, respectively.

Previous research by Baker, Barry and Baker, and Barry and Willmann provide insight into the role that credit plays

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in a farmer's liquidity management, differences in credit appraisals among lenders, and farmers' perceptions of how these appraisals affect their management decisions (Barry, Baker, and Sanint). These early research efforts involved credit concepts and measurement procedures that were developed in deterministic terms, so that once the composition of credit was known it was assumed it could be relied upon with complete certainty (Barry, Baker, and Sanint). The reduction in available credit reserves encountered by a large percentage of American farmers through the mid-1980s suggests that lenders not only have adjusted their 'rules of thumb' used to determine a firm's credit limit, but that lenders are also more likely to adjust a firm's credit reserve more frequently during periods of economic instability or growth. Farmers have by necessity had to become more aware of the credit determinants used by their lenders as well as the credit evaluation process itself. As a result, credit risk has become an additional element in the risk assessment of a farm firm.

In an effort to expand on earlier deterministic modeling efforts of credit usage and policies, Pederson utilizes a synthetic methodology to develop a conceptualization of the wealth distribution process to evaluate credit criteria and policies. An important strength of this simulation model of firm growth is that it includes a firm/household systems framework to analyze the wealth distribution impact of alternative credit policies on farm firm growth. The model

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simulates production, investment and consumption functions through a modified cash flow approach with a profit maximizing production function as the firm's objective function.

Pederson emphasizes the importance of the following dynamic elements in his theoretical model:

(1) changes in commodity price distributions
(2) growth in the value of assets
(3) technological change
(4) changes in the availability of credit

However, all but the availability of credit were assumed to increase at a fixed rate of change per year beyond the first year.

The Pederson model suffers, therefore, from the fact that it is essentially a deterministic model beyond the first year. For example, the price of corn, which is increased at a constant 2 percent annual growth rate beyond that first year, is the model's only true random variable. While the model specification provides for a dynamic corn price adjustment mechanism, which is operated to shift the corn price distribution based on commodity demand and the government price support system for years 2-15, the underlying corn price trend-line is linear. Further, given the rather favorable initial set of parameter values, the policy analysis is weakened by a failure to simulate credit usage, reserve management, and evaluation of the implications of credit policies under adverse economic outcomes.

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rationing based upon the firm's risk-bearing capacity as measured by the net capital ratio (total assets/total debt) or the debt servicing capacity of the firm (i.e., expected repayment capacity).

Capital investment alternatives, and thus the use of investment credit, are introduced in the model by permitting the decision maker to purchase additional crop land and the necessary machinery to till the additional land. The decision to acquire additional land and the necessary machinery is motivated by the potential of realizing cost economies of size and an increase in operator's net worth as land appreciates in value. If the firm, based on the lender's predetermined credit policies and rules of thumb, did not have sufficient cash down payment and available credit to acquire additional land, the model would then evaluate the decision maker's ability to utilize available liquid assets (subject to a liquidity constraint) and operating credit to purchase additional crop inputs to increase production per acre and net returns per acre for the existing land base. Utilizing the firm's production function and short run marginal cost curve, corn production per acre could then be increased to the limit of the firm's available variable cost production inputs. The model's decision criteria prohibits the firm from acquiring additional land and increasing production per acre in the same year.

Within this structural framework, Pederson evaluates three alternative lending criteria: risk bearing capacity

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(maximum debt/asset ratio), down payment requirements, and loan amortization periods (repayment capability) for three different farm situations. The three farms differ in two resource categories -- physical and financial resource endowments.

Pederson finds that no single credit policy works to provide the greatest potential for growth for farms in all situations. By far, the firm's risk-bearing capacity variable, the maximum allowable debt/asset ratio, has the greatest impact on the firm's net worth growth rate. The financial implications resulting from a liberalization of the down payment requirement are qualitatively quite similar to those generated by an extension of the loan repayment period.

A limitation of Pederson's simulation and sensitivity analysis is its evaluation of only favorable market conditions and positive net cash flow outcomes. The economic implications of commodity price declines, reduced asset values, and asset liquidation, both voluntary and forced, are omitted from the simulation. Furthermore, the study does not examine the decision maker's aversion to risk, the impact of stochastic yields and prices on the firm's net cash flow position, and the subsequent impact on available credit reserves. As a result, the economic consequences of the various credit policies and credit management during periods of economic recession and negative net cash flow are left to future research.

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2.4 Credit Rationing: Theory, Practice and Optimal Leverage

> 'The conventional supposition is that there is available to the firm an unlimited supply of capital resources at going prices and that the entrepreneur therefore adds additonal resources until the purchase price of the marginal input equals the sales price of the marginal output.'
>
> (T.W. Schultz, 1940)

A profit maximizing firm facing certainty will choose that level of output at which marginal revenue equals marginal cost. According to Schultz, this principle is based upon the premise that the firm has unlimited access to all required factors of production. Rationing, the restricting of the consumption of a production input such as credit, will substantially modify what happens within the firm. If a firm is restricted from gaining access to enough credit to permit the acquisition of additional resources to reach the output level where marginal cost equals marginal revenue, then the average cost per unit of output is necessarily increased, and the firm's output is kept below its optimal production level.

Credit rationing can be either supply-(lender) or demand-(borrower) induced. Therefore, the limiting of a firm's financial leverage reflects either external credit rationing by the firm's lenders or internal credit rationing by the firm's decision maker. According to Lee and Barry, external credit rationing exists when the borrower has exhausted all sources of funds available for loans but still

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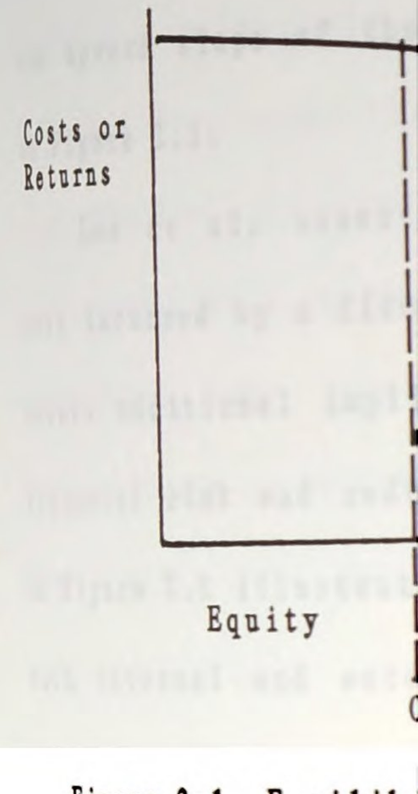
Internal credit rationing by the firm reflects the decision maker's reluctance to use the firm's total credit. Instead, the decision maker elects to maintain a credit reserve as a source of liquidity.

In internal credit rationing, a decision maker utilizes credit through borrowing. Therefore, it is logical to expect the liquidity value of the firm's remaining credit reserve to increase. As a firm's credit is used, a rational, risk averse decision maker will begin to internally ration credit.

Figure 2.1 illustrates graphically the optimum level of financial leverage for a firm assuming that the rate of return on the firm's total capital decreases with the use of additional debt, and that the cost of debt capital increases with additional borrowing.



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1. Source: Lee,W.F., M
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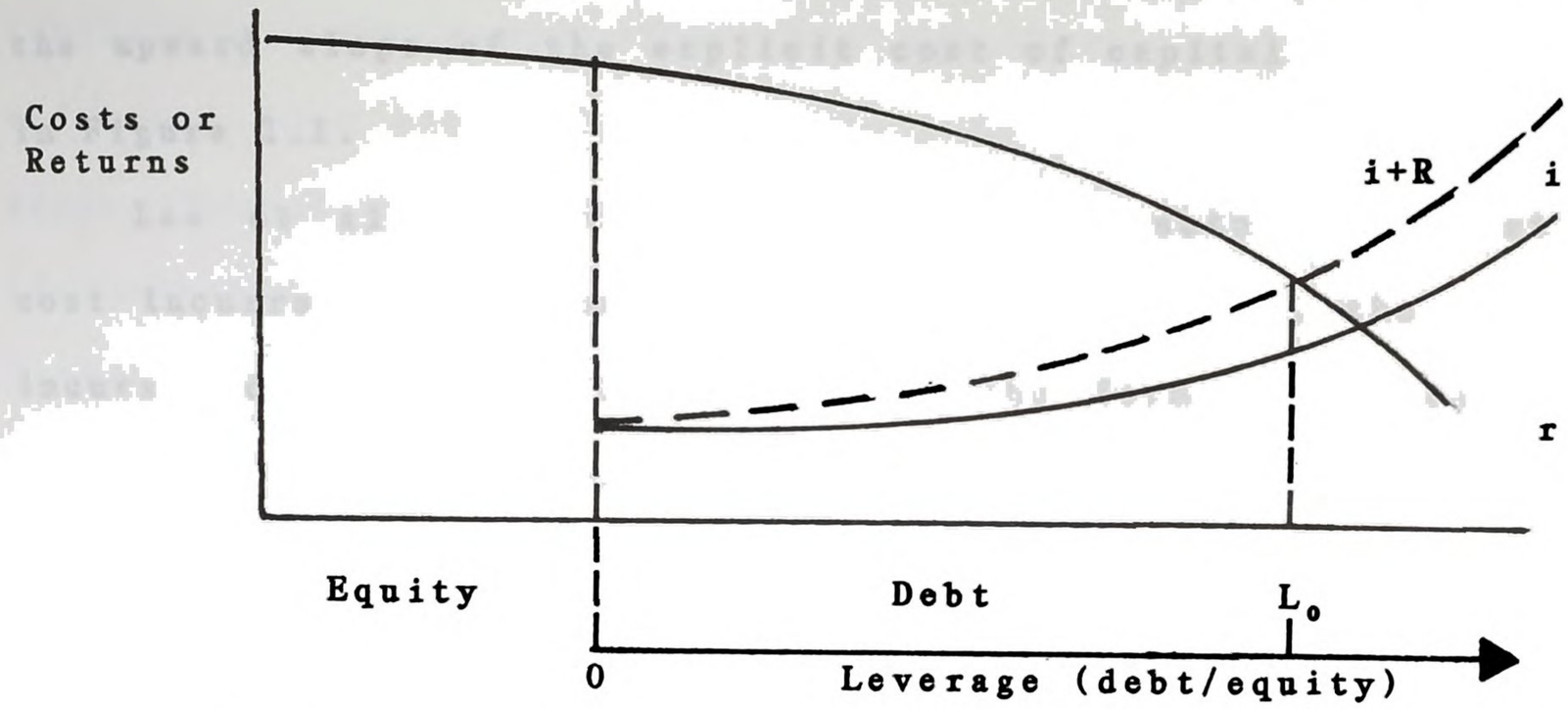

Figure 2-1 Equilibium in the Use of Financial Leverage[1]

Figure 2.1 shows that marginal productivity of total capital (r) will diminish as additional debt capital is combined with a fixed amount of equity capital. The occurrence of external credit rationing is represented graphically by the curve labeled (i). The cost of debt capital, (i), begins to increase when the level of debt outstanding exceeds the lender's 'acceptable' degree of financial leverage, as measured by the firm's debt/equity ratio.

Lee and Barry pointed out that when the typical farm borrower has exhausted conventional loan sources with relatively fixed interest rates, the borrower will attempt to obtain additional funds by approaching such higher cost debt sources as merchants, dealers, and finance companies. The decision maker's willingness to pay the higher interest cost of the secondary source of debt capital is highlighted by

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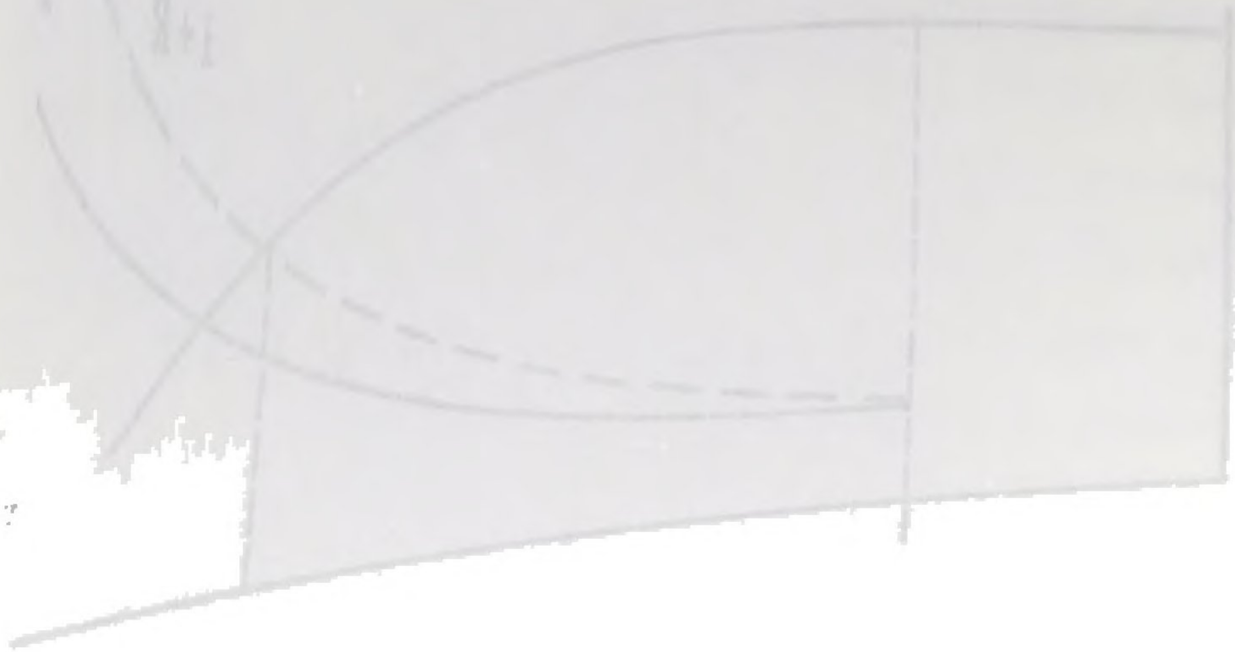
1. Source: Lee,W.F., M.D. Boehlje, A.G. Nelson, W.G. Murray, Agricultural Finance Seventh Edition,Ames, Iowa, 1980, p.37.



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the upward slope of the explicit cost of capital curve (i) in Figure 2.1.

Lee et al. asserts that besides the actual interest cost incurred by a firm in using borrowed capital, the firm incurs additional implicit costs in the form of increased financial risk and reduced credit reserves. The (i+R) curve in Figure 2.1 illustrates the combined cost to the firm from both internal and external credit rationing. Further, the authors state that, conceptually, there is an optimum degree of financial leverage (point L_0 in Figure 2.1) beyond which it does not pay to use additional debt capital. The gain from the use of increased financial leverage is maximized when the marginal rate of return on invested capital, r, is equal to the marginal total cost of borrowed capital, (i+R).

Previous studies have sought to explain why individual firms face an upward sloping interest rate curve. In summarizing previous research, Stiglitz and Weiss say that the upward sloping interest rate curve can be explained by (a) the probability of default for any particular borrower increasing as the amount borrowed increases (Freimer and Gorden), or (b) the lender's mix of borrowers changing adversely (Jaffee and Russell). Stiglitz and Weiss go on: 'we would not expect loans of different size to pay the same interest rate, any more than we would expect two borrowers, one of whom has a reputation for prudence and the other a reputation as a bad credit risk, to be able to borrow at the same interest rate.' Historically, agricultural firms ex-

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hibiting a wide range of credit worthiness and demanding different loan sizes have had access to debt capital at the same interest rate. For years, agricultural interest rates have changed only in response to changes in general economic conditions. Only since the mid-1970s have agricultural lenders begun to differentiate their loan portfolios for loan quality by charging their borrowers risk-adjusted interest rates.

External credit rationing can be administered by lenders through a combination of price and non-price loan contract provisions in order to supply a smaller loan than was demanded by the borrower. While lenders are concerned about both the interest rate they charge on the loan and the riskiness of the loan (probability of default), lenders cannot rely on interest rates alone to ration credit. According to Stiglitz and Weiss, the interest rate a bank charges may affect the riskiness of the bank's loan portfolio through an adverse selection effect. The adverse selection aspect of interest rates is a consequence of the fact that lenders assess borrowers as having different probabilities of repaying their loans. According to Stiglitz and Weiss, the interest rate that an individual is willing to pay may act as a screening device. For example, those individuals willing to pay a higher interest rate may, on average, be worse credit risks. Therefore, when a lender increases the interest rate charged as a means of rationing credit, the risk of the loan increases, possibly reducing

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The adverse interest rate screening effect was evident in agricultural lending during the early 1980s, when the Farm Credit System was forced to maintain higher interest rates at a time when general market interest rates were declining. Farm Credit's higher interest rates were the result of the interest rate adjustment lag that is inherent in Farm Credit's weighted average cost of loan funds. At the same time that Farm Credit had to deal with higher cost loan funds, other agricultural lenders were able to offer loan funds based upon the declining market interest rates. Those agricultural lenders that could offer loans based upon lower marginal cost funds were in a strategic position to select from a larger pool of applicants. As a result, those lenders were able to select only high quality applicants by offering them lower interest rates. The interest rate pricing differential that existed between Farm Credit and its competitors, while expected, proved to be very costly to Farm Credit's earnings and loan portfolio quality. Many of Farm Credit's high quality borrowers elected to refinance their loans at lower interest rates. These creditworthy farmers benefited further by refinancing because they did not have the additional cost of having to maintain ownership of Farm Credit stock. As a result of the large number of refinancings, the overall quality of Farm Credit's loan portfolio deteriorated sharply. This occurrence illustrated the adverse interest rate screening effect described by Stiglitz

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Further, Stiglitz and Weiss state that because a lender cannot directly control all of the actions of a borrower, the lender will formulate the terms of the loan contract in such a way as to induce the borrower to take actions which are in the best interest of the bank. As a result, in order to ration credit, the interest rate charged is not the only term of the loan contract that is important. Non-price factors used by lenders to ration credit include the loan limit, the amount of collateral required, equity position of the firm, loan maturities, loan fees, equity investment in the bank (Farm Credit System stock requirements), loan supervision, and reporting requirements (Stiglitz and Weiss, Barry, Baker, and Sanint, Schultz, and Pederson). For agricultural lenders, non-price contract terms have proven to be of greater importance over time because historically, differential interest rates have not been used by agricultural lenders.

Optimal leverage for a particular firm can be interpreted quite differently by the decision maker and lender. Theoretically, from the lender's perspective, the optimal financial leverage for a firm is determined as that loan size which maximizes the lender's expected profit from the borrower for a given interest rate and costs, considering the probability of default (Jaffee and Modigliani, Fremier and Gorden). Although the economic tenet states that as long as the marginal rate of return on invested capital exceeds

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the marginal cost of nonequity (debt) financing it pays to increase leverage, in practice this principle becomes suspect because lenders look with disfavor on extremely high degrees of leverage (Lee, et al.).

From the decision maker's perspective, the firm's optimal leverage depends on his attitude toward risk, as reflected by the properties of the decison maker's utility function and the level and variability of returns (Robison, Barry, and Burghardt). Further, optimal leverage will change as changes occur in expected returns, interest costs, variances and risk attitudes. The decision maker will seek an optimal level of debt that will maximize the decision maker's end-of-period expected utility.

When a declaration of bankruptcy is considered by the firm, the decision maker's set of choices is altered significantly (Robison and Barry). Robison, Barry and Burghardt show that increased borrowing is a 'rational' and appropriate response in the short run to forestall bankruptcy. As a result, the firm's optimal debt should be expected to increase in the short run as the probability of bankruptcy increases.

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2.5 Modeling Farm Level Borrowing Behavior

A number of significant efforts have been made in the agricultural economics literature to model firm-level borrowing behavior under risk. Sanint constructs a quadratic programming model to describe the decision making process used by lenders when making credit decisions. Postulating normal distributions associated with the variability of rates of returns on assets and interest costs (including the cost of credit), Sanint, as well as Barry, Baker and Sanint, derive the expected results which predict lower loan demand to higher expected interest costs and lower expected returns on assets. The expected interest costs are augmented, however, to account for the variance in credit availability, and hence the value of credit used up with the firm's returns.

Chen, Jen and Zionts make a similiar attempt to measure the liquidity aspect of a firm's decisions when they argue that if the demand for cash were stochastic, assets whose returns were high when cash demands were high would be preferred. They demonstrate this relationship, using a mean variance model, by adding a covariance term to capture the stochastic relationship between the demand for cash and the rates of return on the firm's assets.

Recently, Leatham studied interest rate volatility and its effect on borrower behavior. He observes that lenders have shifted interest rate risk to borrowers by offering variable interest rate loans. Leatham's multi-period dis-

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A still different model has been developed by Robison and Barry, recognizing that credit availability depends on the lender's perception of the borrower's financial condition. Such features as the firm's average liquidity premium, variability of income potential, and existing financial leverage are the major factors that influence credit availability. The analytic interdependency and 'nearly intractible results' of their key variables, however, forced Robison and Barry to develop their credit availability model in a rather deterministic manner based on the modeled firm's financial position in the previous period, rather than on the firm's current period financial position. The authors state that this timing assumption allowed them to present their model results in a more 'tractable' manner.

Robison and Brake suggest a model which also incorporates asset liquidity. In their model, interactions between the borrower and lender determine credit availability to the firm. All of these features, they suggest, could be developed in the context of mean-variance portfolio models. They analyze a borrower's response to single risky and safe investment opportunities using a mean-variance model under varying degrees of financial stress. Robison and Brake impose a constraint which requires the firm to meet all cash flow obligations. In the event of a deficit cash flow and

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credit exhaustion, liquidation of risky assets imposes a liquidation premium on the firm. If an extremely unfavorable outcome were to occur, bankruptcy might result. The possibility of such a disastrous outcome might produce extremely risk preferring behavior on the part of an otherwise risk averse manager, as described by Robison and Lev in their 'Woody Chip' paper.

Robison and Lev hypothesize that a risk averse decision maker, when faced with limited liability in the event of a disasterous outcome such as bankruptcy, may select a risk preferring action choice in order to save his business. The authors discuss the need to map outcome variable distributions to reflect both the initial and final variable distribution. Their limited liability example demonstrates an increase in the preference for the final outcome distribution relative to the initial outcome variable. The final outcome mapping results in the truncation of the production density function (PDF) distribution which makes the initially riskier PDF distribution more attractive. With truncation of the PDF distribution and shifting of the adverse outcomes to the 'disaster point', there may result a reversal in preference for certain actions over others for some risk averse decision makers. Robison and Lev's approach provides the theoretical basis for understanding the apparently risk preferring behavior by highly leveraged, normally risk averse decision makers who continue to borrow money when faced with increasing probability of bankruptcy.

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Robison, Barry and Burghardt (hereafter referred to as RBB) extend finance theory by accounting for the borrowing behavior of proprietary firms under financial stress, providing a theoretical explanation of the behavior of firms that increase their use of credit when survival is at stake. The authors demonstrate that as a proprietary firm's financial leverage increases, the role of credit or unused borrowing capacity changes. In an imperfect capital market, a firm with a strong wealth (equity) position will use credit as a reserve to avoid incurring asset liquidation costs to meet cash flow obligations. By introducing the probability of bankruptcy to the expected utility maximization model, the authors demonstrate that as financial stress increases, a normally risk averse decision maker will borrow additional debt capital, and thus further increase the firm's financial leverage in an attempt to increase the probability of survival.

The RBB deductive theory model, with its integration of the possibility of bankruptcy, can be used to illustrate Robison and Lev's risk preference reversal behavior by truncating the distribution function for the random variable (ε) at the critical bankruptcy point (ε_0). The result is that an increase in the firm's financial leverage increases the expected rate of return and reduces the variance from investments in risky assets. As a consequence, the optimal level of debt for the normally risk averse investor will increase in the short run.

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While the lender-imposed debt-to-equity ratio variable (α) and the asset liquidation cost variable (ρ) places an upper limit on the firm's borrowings, it has no other effect on the firm's response to possible bankruptcy. The sign for the derivatives of optimal debt with respect to changes in the expected rate of return (r), interest rate charged on debt (i), investor's risk attitude (λ) and beginning-of-period equity position (E_o) are as expected for perfect capital markets and are similiar to the comparative static responses obtained by Barry, Baker and Sanint. The authors also find that an increase in cash withdrawals for consumption (W_d) affects the firm's optimal debt level through its effect on the risk aversion variable (λ). That is, as W_d increases the firm's risk-free wealth decreases so that optimal debt decreases for investors with decreasing absolute risk aversion (that is, for $d\lambda/dW_d < 0$).

The most significant result of the analysis is the response of optimal debt to changes in the critical bankruptcy occurrence point (ε_o). The optimal level of debt for the normally risk averse borrower increases as the probability of bankruptcy increases. In practice, borrowing often does increase as long as the lender is willing to supply additional funds to the financially stressed firm. The authors demonstrate that increasing ε_o causes a greater truncation of the $f(\varepsilon)$ distribution in the left tail, thereby making the $f(\varepsilon)$ distribution more compact and 'less risky'. RBB conclude by stating:

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> 'Consequently, the expected return on risky assets increases and variance decreases. In turn, these effects increase the likelihood of bankruptcy, but also provide the incentives for greater borrowing and increased financial leverage, at least until the lender terminates financing or until the economic events leading to the bankruptcy conditions have changed.'

The RBB model does not address all of the issues associated with the management of credit reserves as a source of liquidity, nor does it examine the possibility of increasing the firm's holdings of risky assets as a response to the increasing probability of bankruptcy. The authors, however, do establish a theoretical framework for explaining a proprietary firm's borrowing behavior with imperfect capital markets under conditions of increasing financial stress that may be extendrd to more complex decision situations. The credit reserve management models that are presented in Chapters 3 and 4 expand on the theoretical framework developed by Robison, Barry and Burghardt.

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2.6 Summary

It is apparent from the literature review and from observing borrowers and lenders that certain features of credit reserve management and optimal debt usage are important theoretically, and, therefore should be included in any model. These features provide a framework for constructing the deductive model described in Chapters 3 and 4.

First, since firms generally have opportunties to invest in risky and riskless investments, decision makers may choose their preferred risk/return relationship.

Second, firms have no choice but to meet cash flow obligations. In the case of unfavorable outcomes (deficit cash flows), firms may balance cash flows through increased borrowings or asset liquidation.

Third, at least part of any firm's balance sheet is composed of assets, which when liquidated would generate less cash than the corresponding reduction in the firm's value (loss of equity). The liquidation of these illiquid assets result in a transaction cost, the liquidation premium. The possibility of increasing liquidation costs, either because of macro or micro variables such as stochastic cash demands or because of unfavorable outcomes relative to interest costs or asset returns, is referred to here as

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Fourth, the credit reserve extended to the borrower by the lender can vary considerably depending on such factors as the firm's existing debt and asset structure, asset liquidation premiums, the firm's liquidity position, and the borrower's variability of income and net cash flow. Increased importance must be placed on credit reserve management and measurement by lenders and borrowers.

Fifth, credit rationing likely will become an increasingly important tool for lender response to loan demand and changing economic variables. As Barry, Baker, and Sanint point out, agricultural lenders have used a number of non-price responses to discriminate among borrowers. With increased competition for higher quality loans, lenders likely will be forced to employ more price discriminating responses in order to maintain and increase their loan portfolio volume and quality.

And lastly, the demand for loan funds depends on the borrower's financial security. For instance, Robison and Lev use their 'Woody Chip' football example to demonstrate this point. Ahead in the fourth quarter, a team in the lead may choose to fall down on the ball to protect against a possible fumble or pass interception, while a team trailing in the final seconds of a game will likely go for the 'Hail Mary' pass to pull out a win. We would expect a model dealing with the issue of optimal debt usage to recognize this risk preference reversal by otherwise risk averse decision

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CREDIT RESERVE MANAGI

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CHAPTER 3

CREDIT RESERVE MANAGEMENT: A THEORETICAL MODEL OF BORROWER BEHAVIOR

3.1 Introduction

The management of a firm's available resources, both tangible and intangible, can present considerable problems during periods of protracted economic instability. Since a firm's credit reserve is an intangible resource, it is particularly difficult to assess and manage the reserve when business and financial risks are steadily increasing. One reason for the difficulty in managing a firm's credit reserve is that most borrowers are not aware of the impact of economic variables or is knowledgeable of the credit analysis process used by lenders in analyzing their firm's credit requests. Further, as a rule, a borrower does not inquire as to his firm's credit capacity and consequently does not know the extent of his firm's total credit reserve.

Usually, it is only if a request for a loan or line of credit is denied that a borrower will investigate his firm's credit position in more detail. Even then, however, the information the borrower may receive from his lender regarding the firm's credit capacity will in most cases be specific to the loan request under consideration and may not accurately reflect the borrower's total credit capacity or reserve. Finally, most borrowers, as well as many lenders,

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do not fully understand how exogenous economic events such as agricultural policy programs, monetary policy, inflation, and, most recently, deflation of land values, affect their access to credit. This lack of understanding of the interrelationships between exogenous economic factors and the conflicting objectives of borrowers and lenders become increasingly evident during periods of economic stress.

Although in most agricultural situations there are no explicit costs involved in maintaining a credit reserve, there are opportunity costs to be considered by the decision maker. By maintaining a credit reserve, a manager forgoes the opportunity of substituting the credit reserve for its next best alternative. Since a credit reserve is an intangible asset, the next best alternative would be to exchange the credit reserve for a tangible asset, such as debt capital, which can be used to acquire additional assets in an attempt to earn a higher rate of return for the business. The difference between the forgone asset's rate of return and the cost of debt capital represents the opportunity cost of holding the credit reserve (Barry et al., Penson and Lins, and Robison). This opportunity cost is, in most cases, a stochastic variable (Robison, Sanint). That is, as the use of debt capital increases, the financial leverage position of the firm increases, thus exposing the firm to increased probability of bankruptcy. The decision to hold a credit reserve, therefore, becomes a choice made under uncertainty.

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stochastic rates of return on the firm's assets and incorporates both credit reserve management and the probability of bankruptcy into the decision maker's expected utility objective function. Since potential asset illiquidity exists in imperfect capital markets, and we are assuming imperfect capital markets in the model, a liquidity premium is incorporated into the model. The liquidity premium associated with the risky asset is defined here as the difference between the risky asset's purchase price -- its value to the firm as a durable resource -- and its cash sale price -- the asset's value to the firm as a source of liquidity. The firm's credit reserve is calculated by using a theoretical 'maximum credit reserve expression' that incorporates the liquidity premium. In this first model, credit serves as both a liquidity buffer against adverse cash flow outcomes and as the only source of capital for the acquisition of additional risky assets. Finally, a truncated probability density function is introduced to examine how a manager's decision making behavior with respect to optimal debt useage will change in response to an increased threat of business failure and potential bankruptcy.

A second model, to be presented in Chapter 4, will expand on the simplified theoretical properties of this initial deductive model, and will include a 'restricted' credit reserve expression. Along with the opportunity to acquire additional risky assets, management will also have the capability of liquidating assets on both a voluntary and

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forced sale basis to expand the alternatives available for managing both deficit cash flows and the firm's restricted credit reserve. The restricted credit reserve expression provides the basis for more robust analysis of optimal credit reserve strategies by utility maximizing decision makers facing the threat of bankruptcy. The models are then operationalized to examine empirically the complex interralationships between variables in the firm's utility maximizing test strategy. The expected analytical results are complicated by the imperfect capital market assumption and inclusion of the segmented/truncated probability density function for the stochastic variable.

3.2 Credit Reserve Model I: Introduction of a Cash Flow Constraint

3.2.1 Model Assumptions

By introducing imperfect capital markets it is possible to relax several of the restrictive assumptions of both perfect capital markets and traditional neo-classical models. The assumptions associated with perfect capital markets include:

(1) All assets are perfectly divisible.

(2) Assets are perfectly liquid, that is, their purchase price equals their selling price.

(3) There is perfect knowledge and foresight which is free to all individuals.

(4) There are no taxes.

(5) All investors are price takers.

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The credit reserve model relaxes the perfect liquidity and complete and costless information assumptions of perfect market models, but retains the balance of the perfect market assumptions. Risk is introduced to the firm through the stochastic net returns (before interest expense) earned on the firm's risky assets, $(r+\varepsilon)$, where ε is a random variable with a mean of zero and a variance of σ^2. The interest rate charged by the lender on debt capital, i, is deterministic.

The firm's credit reserve serves two functions: it is the only source of capital for the acquisition of additional risky assets, and it is the only means of responding to a deficit cash flow. In addition, it is assumed that the firm's balance sheet entries are posted according to historical cost accounting principles, precluding the effect of inflation in this model.

Because the assumption of a single asset classification precludes the holding of a residual cash balance in the event of a positive net cash flow ($\hat{E}>0$), the entire net cash flow is applied toward the amortization of the firm's outstanding debt. The model, therefore, does not provide for systematic amortization of borrowed capital. Instead, amortization occurs on a random basis as positive cash flow permits. It will be demonstrated that this assumption can work for and against the financial viability of the firm, depending upon the stochastic nature and variance in the firm's net cash flow.

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3.2.2 Introduction of the Cash Flow Constraint

In this model, cash flow obligations include the interest payment on the firm's debt, iD, and exogenous cash withdrawals, W. The firm's exogenous demand for cash can consist of withdrawals from the farm firm's earnings for family living and non-farm business activity. Total cash flow obligations (iD+W) can be met by using both net earnings from farm operations and by accessing the firm's credit reserve. The firm's cash flow expression can be summarized as:

$$(3.1) \qquad \hat{E} = (r+\varepsilon)A - iD - W$$

In this simplified model, the cash flow constraint results in only two possible operational alternatives, depending on the outcome to the return on risky assets. First, if the realized net return on the assets $(r+\varepsilon)$ exceeds the total cash flow obligations, $\hat{E} > 0$, then the firm's outstanding debt at the end of the operational period declines by the full amount of $\hat{E}$, while the firm's equity account increases by the same amount. This outcome results in a reduction to both the financial leverage position of the firm as well as the probability of bankruptcy. Finally, the favorable $\hat{E}$ outcome will result in an increase to the firm's end-of-period credit reserve, ceteris paribus.

On the other hand, if net returns were to fall below the firm's total cash flow commitment, $\hat{E} < 0$, the firm experiences a deficit cash flow. The resulting negative cash flow would cause an erosion of the firm's net worth position

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equal to the cash deficit, and would necessitate the use of available credit to satisfy the cash flow constraint, $\hat{E} \geq 0$. The decline in the firm's net worth and the subsequent increase in debt will have the additional effect of reducing the firm's available credit reserve beyond that required to balance the cash deficit.

Another alternative available to management is to increase the firm's holdings of risky assets. This strategy would increase the firm's net profit potential in exchange for using up to 100 percent of the firm's available credit reserve. Although the acquisition of additional risky assets with 100 percent debt financing would expose the firm to increased liquidity risk and an increased probability of bankruptcy, these negative effects would be offset by the potential increase in economic return the firm could realize from the increased holdings of debt financed assets. These favorable effects would include an increase in the firm's expected mean asset return, accompanied by a decline in the variance of the net returns. With this introduction to the model, we will now turn to derivation of the 'maximum' credit reserve expression.

3.3 Derivation of the Firm's Credit Reserve

3.3.1 Balance Sheet Identity Under Imperfect Capital Markets

The firm's beginning-of-period balance sheet can be described by the following basic accounting identity:

$$(3.2) \qquad A_t^b = D_t^b + E_t^b$$

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where A represents the firm's single class of risky assets, D is the firm's outstanding debt capital from a single source and E is the investor's net worth (more commonly referred to as the owner's equity investment in the firm).

There are two financial constraints imposed on the firm in this model. First, the firm's assets must equal the total of its liabilities and equity according to the accounting identity in equation (3.2), and equity must be greater than zero. While it is possible for a firm to exist with a negative net worth, such an occurence is legally defined as insolvency. For this reason, the equity constraint has been included. The second constraint is the cash flow constraint discussed in section 3.2.2.

With imperfect capital markets, a liquidity premium ρ, where $(0 \leq \rho \leq 1)$, can exist for the various classes of assets. With the assumption of perfect capital markets, assets can be bought and sold at the same price, that is, $\rho=0$. Financial assets such as cash or cash equivalents would normally involve a very small ρ, reflecting minimum transaction costs, while assets such as farmland or highly specialized fixed structures and machinery would command higher liquidity premiums.

It is assumed in this model that the firm's lender assigns a ρ value to the assets which reflects the lender's 'best evaluation' of the appropriate liquidity premium for the type of asset being appraised. In practice, the establishment of the ρ value tends to be very subjective. It is

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influenced by a number of factors, including the asset's secondary or resale market, the lending institution's credit policies, the loan officer's prior experience with the firm, and to some extent, by the loan officer's risk aversion.

With only one asset classification in this model, the liquidated value of the firm's risky assets at the beginning of the period can be expressed as:

$$(3.3) \qquad (1-\rho)A_t^b = (1-\rho)(D_t^b+E_t^b)$$

This expression can be rewritten to reflect the fact that if the firm were to liquidate all of it's assets today, the creditor's claims would be paid dollar for dollar equal to the outstanding liability entry on the firm's 'going concern' balance sheet (3.2), while the firm's equity account would bear the full cost of the illiquidity of the risky assets. The resulting expression is:

$$(3.4) \qquad (1-\rho)A_t^b = D_t^b+E_t^b(1-\rho(1.0+1))$$

where 1 is the debt-to-equity ratio for the firm at the time of liquidation. Thus, as a result of the establishment of the liquidity premium, the firm's access to its credit reserve can be affected significantly.

3.3.2 Mathematical Derivation of the 'Maximum' Credit Reserve

The traditional expression for a firm's maximum debt position is represented by:

$$(3.5a) \qquad D \leq LE$$

which can be rewritten as the following equality:

$$(3.5b) \qquad D + C = LE$$

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where C represents the firm's credit reserve and L is the lender's desired debt-to-equity ratio for this particular firm or enterprise. A firm's liquidity-adjusted credit reserve at the beginning of the period can be expressed mathematically by substituting the liquidation value of the firm's equity and debt into equation (3.5b), resulting in:

$$(3.6) \qquad C_t^b = L(1-\rho)E_t^b - D_t^b$$

The derivatives of C_t^b which can be unambiguously signed are:

$$dC_t/dD_t^b < 0$$

$$dC_t/dE_t^b > 0$$

$$dC_t/dL > 0$$

$$dC_t/d\rho < 0$$

Solving equation (3.6) for L, the lender's desired debt-to-equity ratio, results in:

$$(3.7) \qquad L = (C_t^b + D_t^b) / (1-\rho)E_t^b$$

Based on the financial constraint stated earlier, that is, that the firm's net worth or equity account must be equal to or greater than zero, we can solve for the lender's theoretical maximum debt-to-equity ratio, L. The theoretical maximum leverage would be attained when the value of the borrower's liquidated assets just equals the debt outstanding and $E_t^b = 0$. To solve for L_{max} mathematically, first set C_t^b in equation (3.7) equal to zero, substitute for the maximum debt expression and solve for L_{max}. With the firm's net 'after liquidation' equity position equal to:

$$(3.8) \qquad E_t^b = \rho D_{t,max}^b / (1-\rho)$$

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and the firm's maximum debt equal to:

$$(3.9) \qquad D^{b}_{t,max} = (1-\rho)E^{b}_{t} / \rho$$

Substituting the expression for maximum debt into equation (3.8) and setting C^{b}_{t} equal to zero results in:

$$(3.10) \qquad L_{max} = ((1-\rho)E^{b}_{t}/\rho)/(1-\rho)E^{b}_{t}$$

This equation simplifies to the lender's maximum leverage expression:

$$(3.11) \qquad L_{max} = (1-\rho)/\rho$$

3.4 Incorporation of the Firm's Stock and Flow Financial Statements

3.4.1 Description of the Firm's Transactions

This model, the first of two borrower-oriented credit reserve models that will be presented, has been intentionally simplified to facilate the differentiation and analysis of the model's mathematical relationships. Table 3-1 highlights the accounting relationships and transaction variables included in the model. The beginning and end-of-period historical cost basis balance sheets (stock statements) provide the foundation for determining the firm's credit reserve and operational management decisions. The cash flow variables include the net return to the firm's assets, $(r+\varepsilon)A^{b}_{t}$, interest paid on debt capital, iD^{b}_{t}, and cash withdrawals from the business, W. The firm's 'cash in' and 'cash out' transactions are summarized and balanced with the following expression:

$$(3.12) \qquad (r+\varepsilon)(A^{b}_{t}) - i(D^{b}_{t}) - W - \hat{E} = 0$$

From a transaction timimg perspective, all balance

ACTIVITIES	ASSETS	DEBT	EQUITY	CREDIT RESERVE	CASH FLOW
Beginning-of-Period Balance Sheet	$A^b_t = A^b_{t-1} + X_2$	$D^b_t = D^e_{t-1} + X_2$	$E^b_t = E^e_{t-1}$	$CR_t = L(1-\rho)E^b_t - D^b_t$	
Net Asset Returns					$(x+\epsilon)A^b_t$
Interest Paid on Debt					$-iD^b_t$
Cash Withdrawals					$-W$
		$+\hat{E}$	$-\hat{E}$		$+\hat{E}$

ACTIVITIES	ASSETS	DEBT	EQUITY	CREDIT RESERVE	CASH FLOW
Beginning-of-Period Balance Sheet	$A^b_t = A^b_{t-1} + X_2$	$D^b_t = D^e_{t-1} + X_2$	$E^b_t = E^e_{t-1}$	$CR_t = L(1-\rho)E^b_t - D^b_t$	
Net Asset Returns					$(r+\varepsilon)A^b_t$
Interest Paid on Debt					$-iD^b_t$
Cash Withdrawals					$-W$
Cash Flow Balancing		$+\hat{E}$	$-\hat{E}$		$+\hat{E}$
Cash Flow Reconsiliation If: $\hat{E}>0$ and CR=0, Then Forced Asset Liquidation	$-X_1$		$-X_1$		$+X_1$
End-of-Period Balance Sheet	$A^e_t = A^b_t - X_1$	$D^e_t = D^b_t + \hat{E}$	$E^e_t = E^b_t - \hat{E} - X_1$		
End-of-Period Transactions- If CR>0 Then Acquire Assets	$+X_2$	$+X_2$		$-X_2$	
Beginning-of-Period (t+1) Balance Sheet	$A^b_{t+1} = A^e_t + X_2$	$D^b_{t+1} = D^e_t + X_2$	$E^b_{t+1} = E^e_t$	$CR_{t+1} = L(1-\varepsilon)E^b_{t+1} - D^b_{t+1}$	
Cash Flow Summary Statement	$(r+\varepsilon)A^b_t - iD^b_t - W + \hat{E} + X_2 + X_1 = 0$				
	If $\hat{E} < 0$ and CR=0, then $X_1 > 0$: otherwise $X_1 = 0$				
	given CR > deficit $\hat{E}$				

Table 3-1 Accounting Transaction Table for a Firm at Risk and Subject to Lender Imposed Credit Limits

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firm is thereby pre
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asset's purchase p
available credit r
should be made onl
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next period, and
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sheet and income statement transactions are assumed to occur nearly simultaneously, but in a specific order on the last day and the last minute of the firm's fiscal period. For agricultural firms, this is usually 12/31/XX. On that date, management is in a position to evaluate actual cash flow performance relative to expectations for the current period. Given that this model has only one stochastic variable, net asset returns, evaluation of the end-of-period cash flow is relatively straightforward. If the cash flow balancing variable $\hat{E}$ is positive, the firm has cash inflows in excess of outflows for the period. In this case, the total residual cash flow is credited to the equity account and debited against the outstanding debt balance, thereby providing for amortization of the firm's debt. Because of the single asset classification, this is the only transaction possible, the firm is thereby prevented from holding residual cash or cash equivalents for liquidity purposes.

Acquisition of additional risky assets, (X_2), with 100 percent debt financing can occur as long as the prospective asset's purchase price is less than or equal to the firm's available credit reserve. The decision to purchase the asset should be made only after the firm's managment has evaluated the probability of each possible cash flow outcome for the next period, and has assessed the firm's exposure to possible bankruptcy. Consequently, management must consider both the explicit cost of using the firm's available credit for the asset purchase, iX_2, and the implicit cost of reduc-

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ing available liquidity. The explicit opportunity cost of credit has been incorporated in the model through the mathematical derivation of the probability and cost of bankruptcy to the firm.

3.4.2 The Firm's Critical Bankruptcy Outcome: ε_0

In this model, the firm is declared bankrupt if it is unable to generate enough cash either from operations or by accessing its credit reserve to balance a deficit cash flow. In other words, the firm has a cash flow deficit and has exhausted its available credit reserve, $C_t^b=0$. This will result in the firm's net after-liquidation equity position being less than the liquidation premium on the firm's outstanding debt balance. This relationship can be expressed mathematically as:

$$(3.13) \quad (1-\rho)E_t^e \leq \rho D_t^e$$

When equation (3.13) holds, the firm is legally insolvent or bankrupt and will be forced by its creditor(s) to liquidate 100 percent of its assets (Walter).[1]

The probability distribution function for the stochastic variable, ε, can be expressed in relation to the firm's critical bankruptcy point, ε_0. For those stochastic rates of return to the firm's assets, $(r+\varepsilon)A_t^b$, plus the firm's beginning-of-period credit reserve, C_t^b, exceed the firm's

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1. For purposes of simplication, our discussion of bankruptcy and the zero end-of-period wealth position in the event of bankruptcy intentionally ignores the asset retention provisions provided for under the current bankruptcy laws.

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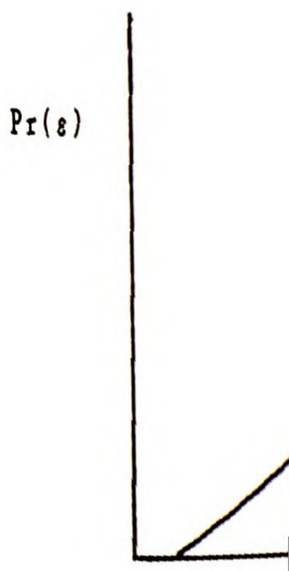

Figure 3-1: T
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The location of ε_0

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The firm's

cash flow obligations, the firm will survive financially. This relationship can be expressed as $\varepsilon_i > \varepsilon_0$.

For those rate of return outcomes where the stochastic variable is less than the firm's bankruptcy point, $\varepsilon_i \leq \varepsilon_0$, the firm's realized net return plus available credit reserve is inadequate to balance the deficit cash flow. The consequence of this outcome is bankruptcy. Therefore, the outcome of the stochastic element ε, associated with the firm's risky asset rate of return, determines the response behavior of the firm. A graphic illustration of ε_0 is presented in Figure 3-1.

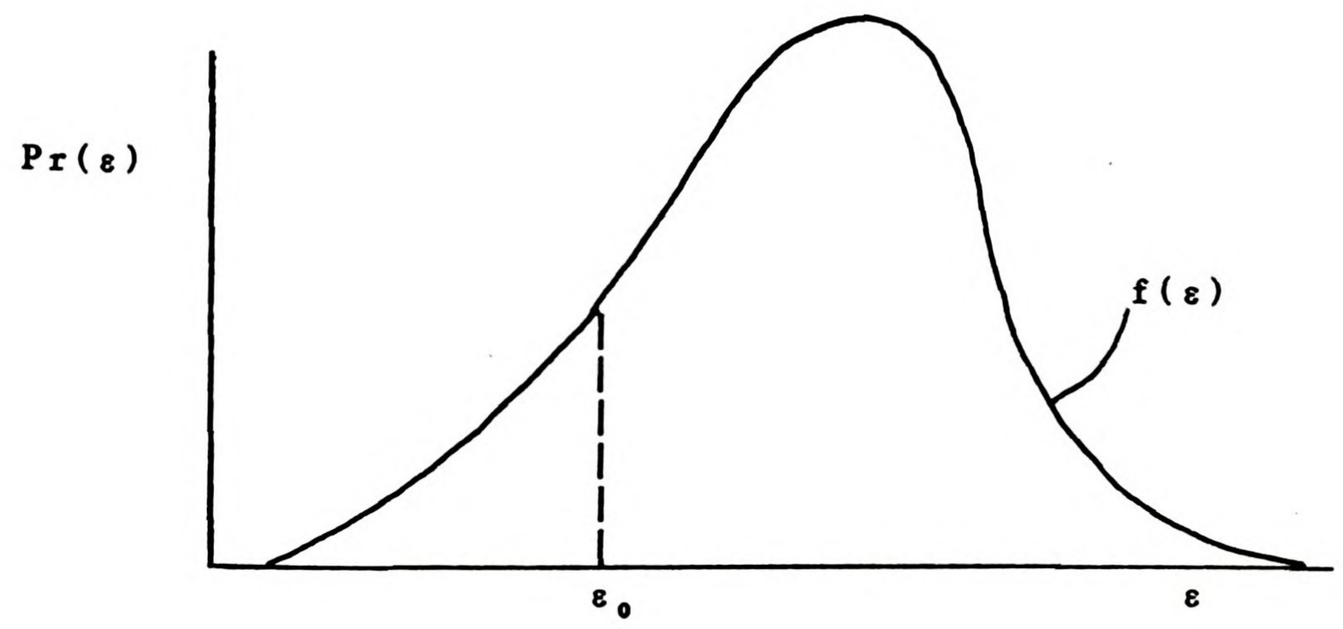

Figure 3-1: The Probability Density Function Associated with Stochastic Returns on Investments

The location of ε_0 in Figure 3-1 is the firm's bankruptcy or disaster outcome. All ε outcomes below the critical ε_0 level will leave the firm with identical end-of-period wealth: zero.

The firm's probability of bankruptcy is equal to the cumulative distribution of the probability distribution

described in Figure

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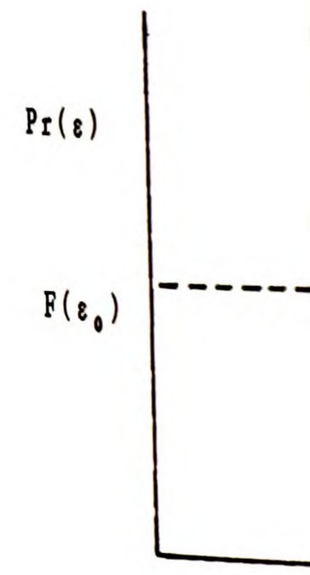

Figure 3-2: T
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$dF(\varepsilon_0)$

$dF(\varepsilon_0)$

$dF(\varepsilon_0)$

described in Figure 3-1 as that area of the distribution to the left of ε_0. The cumulative distribution can be written as:

$$(3.14) \qquad F(\varepsilon_0) = \int_{-\infty}^{\varepsilon} f(\varepsilon)d\varepsilon$$

The mathematical relationship described in equation (3.14) is illustrated in Figure 3-2 as the truncation of the probability density function at the ε_0 point.

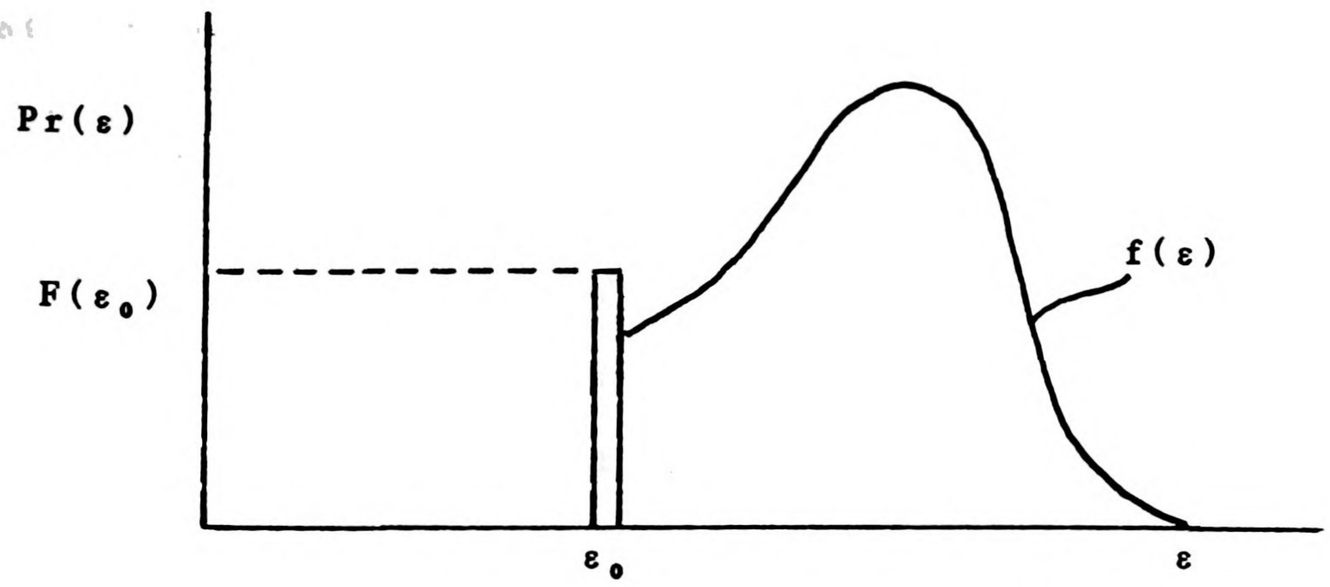

Figure 3-2: Truncation of the Probability Density Function at the Bankruptcy Point: ε_0

As the value of ε_0 changes and, hence, the cumulative distribution $F(\varepsilon_0)$ changes unambiguously in response to increases in r, i, W, and E_t:

$$dF(\varepsilon_0)/dr < 0,$$

$$dF(\varepsilon_0)/di > 0,$$

$$dF(\varepsilon_0)/dW > 0, \text{ and}$$

$$dF(\varepsilon_0)/dE_t < 0$$

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The changes in the likelihood of bankruptcy, however, are ambiguous in response to a change in the firm's debt holdings. In fact,

$$(3.15) \quad dF(\varepsilon_o)/dD_t = f(\varepsilon_o)\partial\varepsilon_o/\partial D_t$$
$$= f(\varepsilon_o)[(1+i)E_t - W]/(D_t+E_t)^2 \quad \langle = \rangle \ 0$$

The ambiguous result in equation (3.15) is the same as was described in chapter 1. For the financially secure firm, if the firm's safe earnings plus its equity are sufficient to meet exogenous cash requirements, W, the probability of bankruptcy without debt is zero. Increasing the firm's holdings of risky assets can only increase its likelihood of default. For the financially insecure firm which cannot meet exogenous cash requirements without borrowing, it is only by increasing debt obligations, and $(r+\varepsilon) > i$, that the likelihood that the firm will go bankrupt can be reduced below 1.

Combining the cumulative probability of bankruptcy which results in the truncation of the ε outcome probability density function at the firm's bankruptcy point, ε_o, and the liquidity premium, ρ, associated with the sale of the firm's assets in an imperfect capital market, can be presented graphically, with the firm's probability density function becoming discontinuous at two points. The firm's probability density function associated with stochastic returns is now discontinuous at the bankruptcy point, ε_o, and at a point to

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Figure 3-3: T
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3.5 Mathematical D

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be written as:

(3.16) $C_t^e =$

the right of the ε_0 point equal to the total cost of liquidating the firm's assets in the event of bankruptcy, ρA^e. Figure 3-3 highlights this relationship.

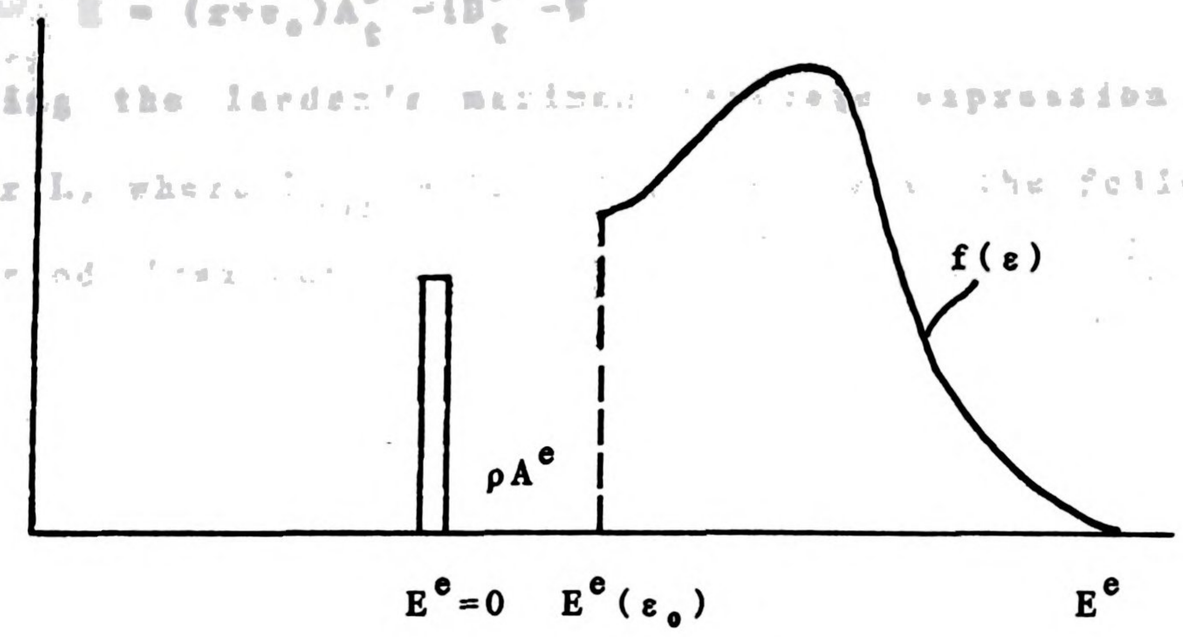

Figure 3-3: The Probability Distribution of a Firm's End-of-Period Equity Position When the Probability of Bankruptcy is Greater Than Zero

Having described the first credit reserve model, it is time to present the model mathematically and solve for the firm's control variable, the optimal level of beginning-of-period debt. Solving for the firm's optimal debt level, D_t^{b*}, will result in maximizing the firm's end-of-period equity position.

3.5 Mathematical Derivation of Credit Reserve Model I

3.5.1 Determination of the Firm's Critical Bankruptcy Expression: ε_0

The firm's end-of-period credit reserve expression can be written as:

$$(3.16) \qquad C_t^e = L(E_t^b + \hat{E}) - (D_t^b - \hat{E})$$

with $\hat{E}$ representing

flow balancing equ

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the equation is wri

(3.17) $\hat{E} = (r+$

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Rearranging and s

(3.20b) $\varepsilon_0 =$

Substituting the

results in:

(3.20c) $\varepsilon_0 =$

where X_2 is the

tional risky ass

with $\hat{E}$ representing the expression for the firm's net cash flow balancing equation for the current fiscal period. Incorporating the expression for the bankruptcy point, ε_0, the equation is written as:

$$(3.17) \quad \hat{E} = (r+\varepsilon_0)A_t^b - iD_t^b - W$$

Substituting the lender's maximum leverage expression into (3.16) for L, where $L_{max} = (1-\rho)/\rho$, results in the following end-of-period 'maximum' credit reserve expression for the firm:

$$(3.18) \quad C_t^e = (1-\rho)/\rho \ (E_t^b+\hat{E}) - (D_t^b-\hat{E})$$

Rewriting the end-of-period credit reserve expression (3.18) by setting $C_t^e = 0$ and expressing it in terms of $\hat{E}$ results in:

$$(3.19) \quad \hat{E} = \rho D_t^b - (1-\rho)E_t^b$$

To solve for the critical ε_0 expression, set the credit reserve expression (3.18) equal to the cash flow expression (3.17) and solve for ε_0:

$$(3.20a) \quad \rho D_t^b - (1-\rho)E_t^b = (r+\varepsilon_0)(D_t^b+E_t^b) - iD_t^b - W$$

Rearranging and simplifying terms yields:

$$(3.20b) \quad \varepsilon_0 = (((\rho+i)D_t^b - (1-\rho)E_t^b + W)/(D_t^b+E_t^b)) - r$$

Substituting the end-of-period terms for D_t^b and E_t^b results in:

$$(3.20c) \quad \varepsilon_0 = (((\rho+i)(D_{t-1}^e+X_2) - (1-\rho)E_{t-1}^e + W) / (D_{t-1}^e+X_2+E_{t-1}^e)) - r$$

where X_2 is the variable representing the purchase of additional risky assets which can be purchased only with 100

percent debt. All o

the variables desc

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ε_0 include:

$$d\varepsilon_0/dr = -1$$

$$d\varepsilon_0/dW = 1/$$

$$d\varepsilon_0/d\rho = 1$$

$$d\varepsilon_0/di = (D$$

$$d\varepsilon_0/dX_2 = ((($$

$$d\varepsilon_0/dD^e_{t-1} = (($$

$$d\varepsilon_0/dE^e_{t-1} = (-$$

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percent debt. All of the derivatives of ε_0, with respect to the variables described, can be unambiguously signed with the exception of $d\varepsilon_0/dD^e_{t-1}$ and $d\varepsilon_0/dX_2$. The derivatives of ε_0 include:

$$d\varepsilon_0/dr = -1 \qquad < 0$$

$$d\varepsilon_0/dW = 1/(D^e_{t-1}+X_2+E^e_{t-1}) \qquad > 0$$

$$d\varepsilon_0/d\rho = 1 \qquad > 0$$

$$d\varepsilon_0/di = (D^e_{t-1}+X_2)\ /(D^e_{t-1}+X_2+E^e_{t-1}) \qquad > 0$$

$$d\varepsilon_0/dX_2 = ((1+i)E^e_{t-1}-W)/((D^e_{t-1}+X_2+E^e_{t-1})^2) \qquad ?$$

$$d\varepsilon_0/dD^e_{t-1} = ((1+i)E^e_{t-1}-W)\ /((D^e_{t-1}+X_2+E^e_{t-1})^2) \qquad ?$$

$$d\varepsilon_0/dE^e_{t-1} = (-(1+i)(D^e_{t-1}+X_2)-W) /((D^e_{t-1}+X_2+E^e_{t-1})^2) \qquad < 0$$

As would be expected, an increase in the net return on the risky assets and an increase in the firm's equity position clearly will reduce the probability of bankruptcy. Referring again to Figure 3-1, these favorable transactions would be reflected as a leftward shift in the ε_0 point. On the other hand, an increase in either the exogenous cash withdrawals, the liquidity premium, or the interest rate charged on the debt capital, will increase the probability of the firm going bankrupt. The occurrence of any of these outcomes will result in a shift in the critical ε_0 value to the right. The effect of both an increase in debt and the purchase of additional risky assets (financed completely with debt capital) on the ε_0 point is ambiguous. However, for both of these derivatives to be positive, the conditions

that $(r+\varepsilon_0) > i$, an

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3.5.2 Derivation o

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segments yields:

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where

$E^e_t =$

The first integr

from the probabi

that $(r+\varepsilon_0) > i$, and $(1+i)E^e_{t-1} > W$, must be met. Having now derived the expression for the firm's bankruptcy threshold point, it is now possible to solve for the firm's objective function.

3.5.2 Derivation of the Firm's Objective Function

Since management's operational objective is to maximize end-of-period wealth while avoiding bankruptcy, several additional factors must be considered in achieving the optimal use of debt.

If the probability of bankruptcy is greater than zero, $Pr(\varepsilon < \varepsilon_0) > 0$, the firm faces the posibility of insolvency and ultimate liquidation. With the assumption of imperfect capital markets, the firm's assets can be sold, but at a cost of ρA^e, where ρ is a constant liquidity premium charged proportionally on all of the firm's assets in this model.

Since the possible operational outcomes for the at-risk firm have been divided into two ranges, those outcomes where $\varepsilon >= \varepsilon_0$ and $\varepsilon < \varepsilon_0$), it is useful to form the firm's objective function in two components as well. Expressing the expected utility model mathematically for the two outcome segments yields:

$$(3.21) \quad EU(E^e_t) = U(0)\int_{-\infty}^{\varepsilon_0} f(\varepsilon)d\varepsilon + \int_{\varepsilon_0}^{\infty} U[E^e_t]\, f(\varepsilon)d\varepsilon$$

where

$$E^e_t = E^b_t + (r+\varepsilon)(D^b_t+E^b_t) - iD^b_t - W$$

The first integral expression summarizes the firm's utility from the probability of ending the current operating period

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(3.22b) $dEU(E^e_t$

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with an operating outcome in which the firm loses all of its equity and experiences bankruptcy. The second integral expression sums the utility values for all outcomes which leave the firm with a positive equity value.

To solve for the firm's decision variable, the optimal beginning-of-period debt level, D_t^b, we solve for the first order conditions of equation (3.21):

$$(3.22a)\quad dEU(E_t^e)/dD_t^b = U(0)(d\varepsilon_0/dD_t^b)f(\varepsilon_0) - U(\varepsilon_0)(d\varepsilon_0/dD_t^b)\ f(\varepsilon_0)(\partial\varepsilon_0/\partial D_t^b) + \int_{\varepsilon_0}^{\infty} U'[E_t^e](\partial E_t^e/\partial D_t^b)\ f(\varepsilon)d\varepsilon = 0$$

Recognizing that the first two terms in (3.22a) equal zero because the ε_0 outcome leaves the firm with $E^e_{t(\varepsilon_0)}=0$, (3.22a) can be rewritten as:

$$(3.22b)\quad dEU(E_t^e)/dD_t^b = \int_{\varepsilon_0}^{\infty} U'[E_t^e]\ \partial E_t^e/\partial D_t^b\ f(\varepsilon)d\varepsilon$$

Differentiating E_t^e with respect to D_t^b and substituting the result into (3.22b) results in:

$$(3.22c)\quad dEU(E_t^e)/dD_t^b = \int_{\varepsilon_0}^{\infty} U'[E_t^b+(r+\varepsilon)(D_t^b+E_t^b)-iD-W](r+\varepsilon-i)\ f(\varepsilon)d\varepsilon = 0$$

To ensure that we have solved for the optimal or maximum beginning-of-period debt, $EU(E_t^e)=0$, the second derivative of (3.22b) with respect to D_t^b, must be less than or equal to zero:

$$(3.23a)\quad \partial[dEU(E_t^e)/dD_t^b]/\partial D_t^b\ dD_t^b = \int_{\varepsilon_0}^{\infty} U''[E_t^e](r+\varepsilon-i)^2\ f(\varepsilon)d\varepsilon - (\partial\varepsilon_0/\partial D_t^b)\ U'[E_t^e(\varepsilon_0)]\ (r+\varepsilon_0-i)f(\varepsilon_0) \leq 0$$

Substituting for ∂e

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Substituting for $\partial\varepsilon_o/\partial D_t^b$ and E_t^e results in:

$$(3.23b)\quad \partial[dEU(E_t^e)/dD_t^b]/\partial D_t^b dD_t^b = \int U''[E_t^b+(r+\varepsilon)(D_t^b+E_t^b) -iD -W] (r+\varepsilon-i)^2 f(\varepsilon)d\varepsilon - [(1+i)E_t^b -W/(D_t^b+E_t^b)^2] \quad U'[E_t^b+(r+\varepsilon_o)(D_t^b+E_t^b) -iD_t^b -W] (r+\varepsilon-i) f(\varepsilon_o) \leq 0$$

An examination of the signs on the components of (3.23b) reveals that we have reached an optimal solution.

To illustrate the solution for the firm's optimal borrowing decision, D_t^b, when the firm faces the possibility of bankruptcy, $Pr(\varepsilon<\varepsilon_o)$, we assume that the decision maker's set of preferences is represented by a negative exponential utility function:

$$(3.24)\quad EU(E_t^e) = 1-e^{-\lambda E_t^e}$$

where λ is a measure of the manager's degree of risk aversion and $\lambda>0$. Thus, when the firm's end-of-period equity equals zero, $E_t^e=0$, the operator's expected utility is zero, $EU(E_t^e)=0$. Incorporating these assumptions into the model, the expected utility maximizing expression is:

$$(3.25)\quad EU(E_t^e) = \int_{\varepsilon_o}^{\infty} (1-e^{-\lambda E_t^e}) f(\varepsilon)d\varepsilon$$

To find the level of debt that maximizes the decision maker's utility differientiate equation (3.25) with respect to the beginning-of-period debt:

$$(3.26)\quad dEU(E_t^e)/dD_t^b = \int_{\varepsilon_o}^{\infty} \lambda(r+\varepsilon-i)\, e^{\lambda E_t^e} f(\varepsilon)d\varepsilon = 0$$

To verify that (3.26) is indeed a maximum debt solution, we test the second order conditions:

$$(3.27)\quad d^2EU[E_t^e]/dD_t^{b2} = -\int_{\varepsilon_o}^{\infty} \lambda^2(r+\varepsilon-i)^2 e^{-\lambda E_t^e} f(\varepsilon)d\varepsilon - (\partial\varepsilon_o/\partial D_t^b)\lambda(r+\varepsilon_o-i)e^{-\lambda E_t^e(\varepsilon_o)} f(\varepsilon_o) < 0$$

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If the second term in (3.27) is negative, the solution is indeed a maximum because the first term is unambiguously negative. The second term is negative if $(\partial\varepsilon_0/\partial D_t^b)(r+\varepsilon_0-i) \geq 0$. To check the sign for this conditional expression substitute for both $d\varepsilon_0/dD_t^b$ and ε_0 and check the sign as follows:

$$(3.28)\quad [(E_t^b(1+i)-W)/(D_{t-1}^e+X_2+E_{t-1}^e)]* \\ [(((\rho+i)(D_{t-1}^e+X_2)-(1-\rho)E_{t-1}^e+W)/(D_{t-1}^e+X_2+E_{t-1}^e)) \\ +(r-i)] \geq 0$$

As stated earlier, if $(r+\varepsilon)>i$ and $E_t^b(1+i)>W$, then $d\varepsilon_0/dD_t^b$ is positive. The $(1+i)E_t^b$ expression represents the opportunity rate of return on the firm's equity capital. For instance, if no risky assets were acquired, then $i=r_f$, where r_f represents management's best risk-free investment rate of return. The conditional statement that $E_t^b(1+i)>W$ therefore implies that the annuity stream from the firm's equity capital must exceed the decision maker's exogeneous cash withdrawals, W, or the firm's equity position (investment stock) will decline.

3.5 Summary

An attempt was made to mathematically derive the sign for each of the partial derivatives of optimal debt with respect to each key variable. Unlike the results from previous studies (Barry, Baker and Sanint) where the the probability of bankruptcy was assumed to be zero, $Pr(\varepsilon < \varepsilon_0) = 0$, incorporating the possibility of bankruptcy into the firm's

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objective function as this model does will result in ambiguous results. As a result of the ambiguous results, this first model will not be evaluated with regard to individual variable sensitivity on optimal debt solutions. Instead, the sensitivity analysis will be conducted on the second, more complex model which will be presented in Chapter 4. Discussion of the sensitivity results for Model II will be extended to this model.

The most important feature of Model I is the interaction between the stochastic earnings of the firm and the credit extended by the lender. By requiring that deficit cash flows be satisfied, the maximum credit available from the firm's lender is automatically adjusted. Thus, Model I captures what many have claimed to be an important feature of firm borrowing behavior, incorporating the possibility of bankruptcy in the firm's objective function. The second model, which will be presented in Chapter 4, will build on the relationships developed in this first model by introducing additional concepts such as a restricted credit reserve and voluntary asset liquidation.

CREDIT RESERVE MODE

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CHAPTER 4

CREDIT RESERVE MODEL II: INTRODUCTION OF A RESTRICTED CREDIT RESERVE

4.1 Model Assumptions

Model II builds upon the basic financial and structural relationships contained in Model I, and introduces several additional variables to strengthen and broaden the theoretical and analytical capabilities of the first model. The most important feature added to this second model is the concept of a firm's 'restricted' credit reserve. In Model I the firm's credit reserve expression incorporated the lender's theoretical maximum leverage ratio: $L_{max}=(1-\rho)/\rho$. Use of L_{max} permitted unrestricted borrowing from the firm's credit reserve up to the point where the net value of the firm's assets after liquidation costs equals the firm's outstanding debt, $(1-\rho)A_t^b = D_t^b$. In Model II, as in practice, the leverage ratio used includes a credit policy variable, delta (δ), which is derived from the lender's profit maximizing utility function and acts to restrict the credit available to the firm. The restricted leverage ratio with delta included can be expressed as:

$$(4.1) \qquad L = (1-\rho)(1-\delta)/\rho$$

where ($0<\delta<1$) and at the theoretical L_{max}, $\delta=0$.

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Incorporation of the restricted credit reserve concept will require that the management of the firm to consider both voluntary (X_1) and forced asset liquidation (X_3) in the event the of a cash flow deficit. As a result, in addition to incorporating the probability of bankruptcy (ε_0) as a result of total business risk exposure, Model II also requires that management decide on its optimal debt level knowing that it has access to a restricted credit reserve. In Model II the restricted credit reserve exhaustion point is labeled ε_1. An ε_i outcome below ε_1, the firm's restricted credit reserve exhaustion point, requires management to voluntarily liquidate assets to bring the firm's financial accounts into compliance with lender-imposed credit standards. As with forced asset liquidation, the firm incurs a total transaction cost equal to ρX_1 for voluntary asset liquidation.

As in Model I, the firm has the option of acquiring additional risky assets (X_2), up to the dollar limit imposed by the firm's beginning-of-period restricted credit reserve. Further, it is assumed that the assets are of a single classification, are durables, and divisible in both acquisition and sale. As was the case in Model I, all asset acquisitions must be financed with 100 percent debt capital.

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4.2 Analysis of Voluntary and Forced Asset Liquidation on the Firm's Wealth Position with Imperfect Capital Markets

4.2.1 Voluntary and Forced Asset Liquidation with Imperfect Capital Markets

Model II provides for two types of asset liquidation assuming imperfect capital markets, forced and voluntary. An asset is illiquid if it is traded in an imperfect market. The difference between an asset's acquisition price and its sale price is the transaction cost or liquidity premium equal to ρ percent of the asset's value to the firm. The concept of liquidity is based on the relationship between the value of an asset to a firm as a production resource compared to its expected cash value to the firm at the time of sale (Barry, Baker and Sanint). Factors which influence the magnitude of the liquidity premium for any classification of assets include transaction fees, marketing, the time available for the systematic liquidation of the assets (eg. forced sale), liquidity risk and the asset's impact on the firm's capital integrity (Barry, Baker and Sanint). In this model, as in Model I, there is only one liquidity premium. Further, it is assumed that ρ is fixed regardless of the dollar magnitude of the assets liquidated relative to the firm's total asset position.

4.2.2 Analysis of Voluntary Asset Liquidation

The type of asset liquidation (voluntary or forced) will determine how the transaction will effect the firm's balance sheet and credit reserve accounts. In this model,

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voluntary asset liquidation is undertaken to bring the firm's restricted credit reserve into compliance with either the lender's predetermined beginning-of-period minimum credit reserve level or to bring the firm's restricted credit reserve up to zero after experiencing a deficit cash flow. Furthermore, as in practice, management could elect to voluntarily liquidate assets in an attempt to reduce the firm's financial risk exposure (probability of bankruptcy). For example, a risk averse decision maker could use voluntary asset liquidation to reduce the liklihood of bankruptcy while accepting a less than maximum end-of-period wealth position. The accounting implications of voluntary asset liquidation on the firm's financial accounts are highlighted in Figure 4-1.

Figure 4-1, graph (a), illustrates that, for a firm with outstanding debt, as the firm's assets are liquidated beginning at the restricted credit reserve exhaustion point, ε_1, and moving toward the bankruptcy point, ε_0, the slope of the curve is (-1) and the total reduction equals the gross sale price of the assets, X_1. Graph (c) in Figure 4-1 highlights that the firm's debt will decline by $(1-\rho)X_1$ cents for each dollar of asset sold. Graph (d) reveals that the firm's equity account balance would be reduced by ρX_1, the total transaction costs associated with the sale. Finally, graph (b) illustrates that the firm's maximum credit reserve is not affected by the voluntary asset sale, but

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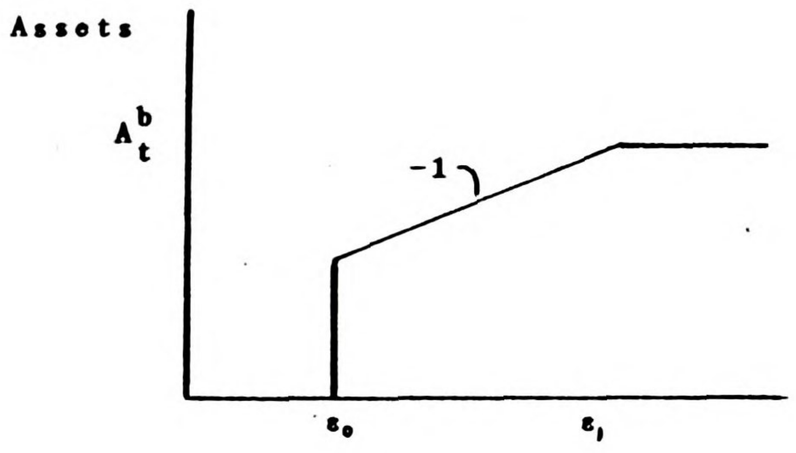

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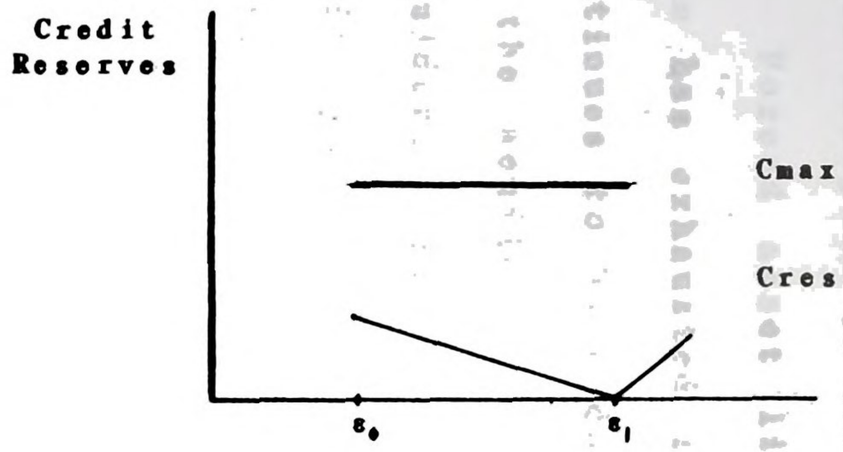

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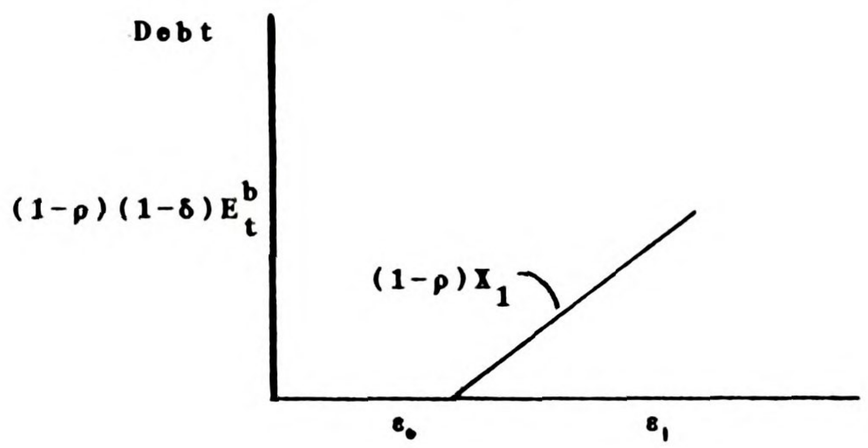

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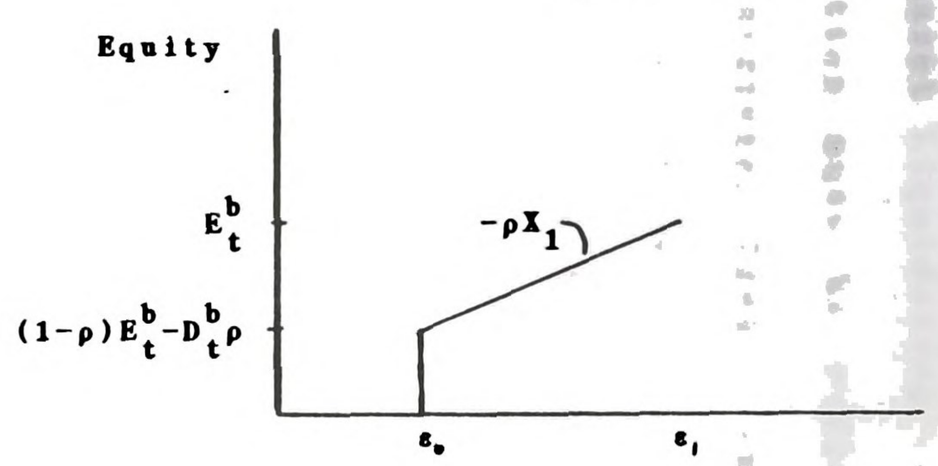

Note: 1) At ε_0, voluntary asset liquidation is at a maximum, $X_{1,max}$

2) At ε_1, voluntary liquidation has not taken place, $X_1=0$

3) In graph (b) the firm's restricted credit reserve, at ε_0, is greater than zero, while at ε_1, the firm's restricted credit reserve is zero

Figure 4-1 Illustration of the Influence of Voluntary Asset Liquidation, (X_1), on the Firm's Financial Accounts

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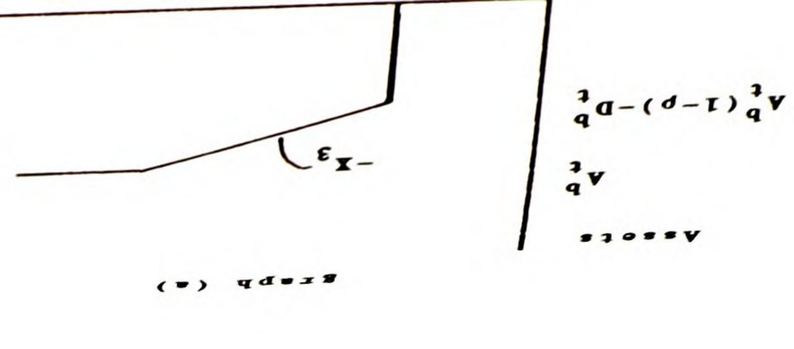
4.2.3 Analysis of Forced Asset Liquidation

Forced asset liquidation must be undertaken when the firm has exhausted its restricted credit reserve and there continues to be a deficit cash flow for the period. Bereft of the benficial aspects of voluntary liquidation, forced liquidation results in reducing the firm's total asset and equity position with no reduction in the firm's outstanding debt. Calculation of the value of assets liquidated under forced conditions can be expressed as:

$$(4.2) \qquad X_3 = (|-\hat{E}|-C_t^b)/(1-\rho).$$

Figure 4-2 illustrates graphically the implications of forced asset liquidation on the firm's financial accounts. Figure 4-2, graphs (a) and (d) highlight the effect of a forced asset sale on the asset and equity accounts of a firm with outstanding debt. With forced asset liquidation, the dollar reduction in the firm's asset and equity accounts needs to be greater than the deficit cash flow, less any restricted credit reserve available, in order to compensate for the transaction costs associated with the sale. Unlike voluntary asset sale, which contributes to a reduction in the firm's outstanding debt balance, a forced asset sale does not provide any reduction in the level of the firm's outstanding debt. All of the assets sold, net of the transaction costs, are required to balance the deficit cash flow.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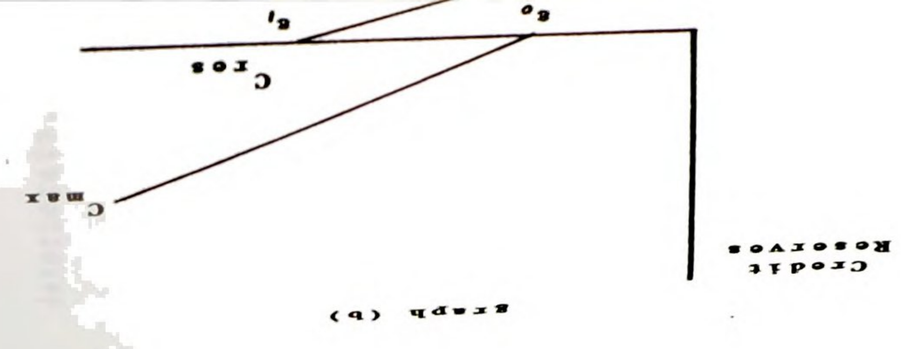
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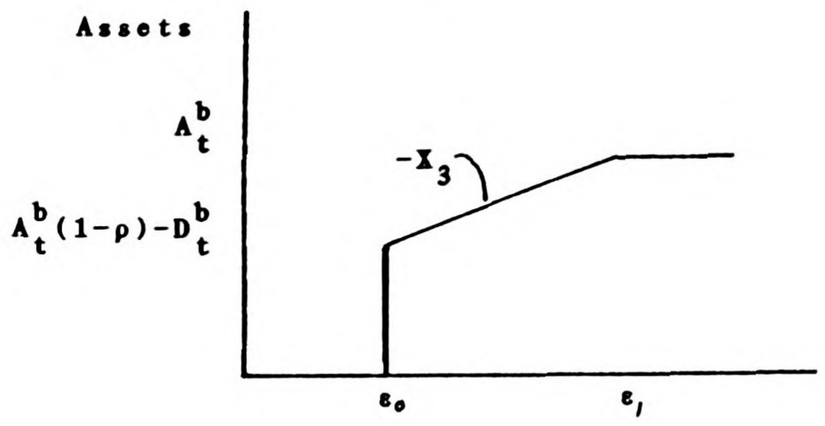

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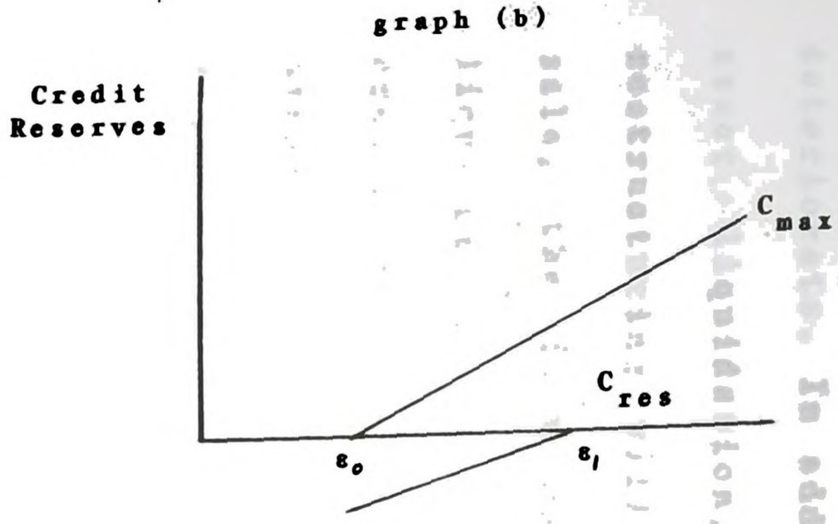

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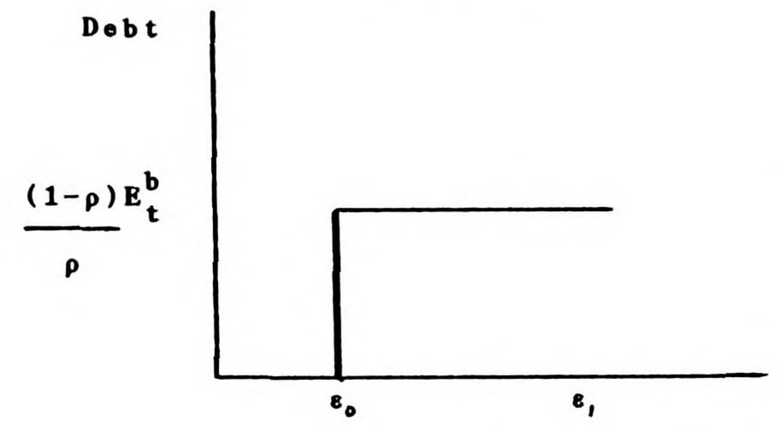

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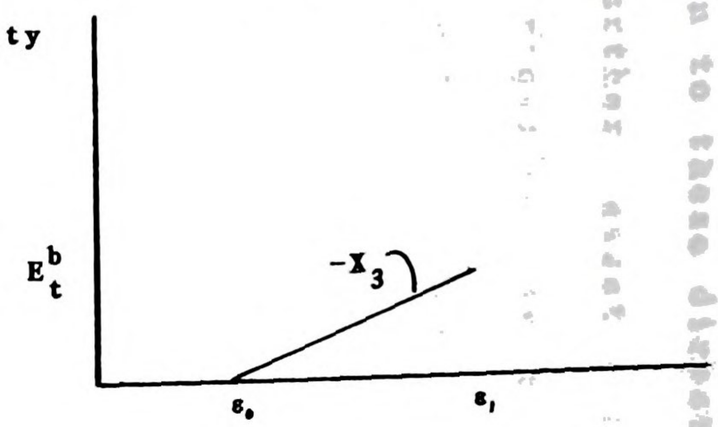

Note: 1) At ε_0, forced asset liquidation is at a maximum, $X_{1,max}$

2) At ε_1, forced liquidation has not taken place, $X_1=0$

3) In graph (b) the firm's restricted credit reserve, at ε_1, is zero, while at ε_o, the firm's restricted credit reserve is negative

4) In graph (b) the slope of the maximum credit reserve expression is $-(1-\rho)/\rho$, while the slope of the restricted credit reserve expression is $-(1-\rho)(1-\delta)/\rho$.

Figure 4-2 Illustration of the Influence of Forced Asset Liquidation, (X_3), on the Firm's Financial Accounts

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Because of the reduction in the firm's equity position without some corresponding reduction in outstand- ing debt, the firm's financial risk exposure increases, while the firm's access to 'available' credit reserves continues to deteriorate. In addition to these direct effects from forced asset liquidation, further asset liquidation and debt restructuring will be required. In the event of a forced sale, the firm must undertake additional voluntary asset liquidation to bring its beginning-of-period restricted credit reserve back into compliance with lender imposed standards. As a result of the subsequent voluntary asset liquidation the firm's debt-to-equity ratio will increase further, thereby increasing the firm's financial risk exposure and probability of bankruptcy going into the next production cycle. Finally, the firm's maximum and restricted credit reserves will both continue to deteriorate as highlighted in Figure 4-2, graph (b).

The maximum forced asset liquidation which a firm can theroretically incur before being forced into bankruptcy can be expressed as:

$$(4.3) \qquad X_{3,max} = A(1-\rho) - D$$

Realizing that with imperfect capital markets, the firm's gross receipts from the sale of assets must be adjusted for the liquidity premium, the maximum cash flow deficit (MAXEM)

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$$(4.4) \qquad MAXEM = A(1-\rho)^2 - D(1-\rho)$$

With the introduction of the restricted credit reserve concept, the maximum operating loss (MAXER) which the firm can incur before exhausting its restricted credit reserve is:

$$(4.5) \qquad MAXER = \frac{(E_t^b - \rho\alpha)(1-\rho)(1-\delta) - \rho(D_t^b - (1-\rho)\alpha)}{((1-\rho)(1-\delta)+\rho)}$$

where $$\alpha = [|C_{t,res}^b|/(1-\rho)]*2$$

Estimation of both the maximum operating loss which the firm can withstand before exhausting its end-of-period restricted credit reserve (MAXER) and the maximum operating loss before bankruptcy (MAXEM) provide management with additional information for decision making. Having knowledge of these measures would assist the firm's decision maker in selecting both strategic and tactical operating strategies for dealing with the firm's business and financial risk, while attempting to maximize end-of-period wealth.

4.3 Determination of the Firm's Restricted Credit Reserve Expression

Determination of the credit reserve in Model I incorporated the lender's 'theoretical' maximum leverage ratio, $L = (1-\rho)/\rho$. In practice, most lenders are far more conservative and use a leverage ratio such that $L < L_{max}$. This

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$$(4.6) \qquad L_{res} = ((1-\rho)(1-\delta))/\rho$$

where $(0 < \delta < 1)$ and at the theoretical maximum leverage, L_{max}, $\delta=0$.

Incorporating this restricted leverage ratio into Model II provides for differentiation between the liquidation costs associated with collateral in the event of liquidation, ρ, while also providing for the introduction of a creditworthiness variable, δ. The delta, δ, can be constructed to reflect a weighted composite creditworthiness variable consisting of such factors as prior years' credit performance, enterprise risk, and financial position. To illustrate the use of the restricted leverage ratio, note that when $\delta=0$ and $\rho = .2$, then $L_{res}=4.0$. If we assume a δ of .25 is associated with excellent credit, the lender's recommended retricted leverage ratio for the firm is 3.0. Now in the case of a firm with a poor credit rating or high operational risk exposure, we could assign $\delta=.75$, with the result being a recommended leverage ratio of 1.0.

Incorporating the restricted leverage concept, the firm's end-of-period credit reserve can be expressed as:

$$(4.7) \qquad C_t^e = (1-\rho)(1-\delta)/\rho(E_t^b + \hat{E}_\varepsilon) - (D_t^b - \hat{E}_\varepsilon)$$

where
$$E_t^b = E_{t-1}^e - \rho X_1$$
$$D_t^b = D_{t-1}^e + X_2 - (1-\rho)X_1$$

This approach to determining the appropriate leverage ratio combines both credit administration and collateral liquidation guidelines for the particular farm operation

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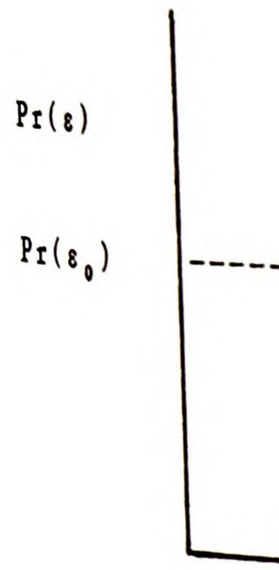

Figure 4-3

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being analyzed. With the introduction of the restricted credit reserve, the firm must now approach investment decisions recognizing that its possible outcomes include not only a 'declaration of bankruptcy' point but also a restricted credit reserve 'exhaustion' point.

4.4 Determination of the Firm's Restricted Credit Reserve Exhaustion Point ε_1

Using a restricted leverage ratio such that $L_{res} < L_{max}$ results in a second partition point on the probability density function distribution (PDF) for ε. This enhancement along with truncating the probability of bankruptcy ($\varepsilon < \varepsilon_0$) at ε_0 is illustrated in Figure 4-3.

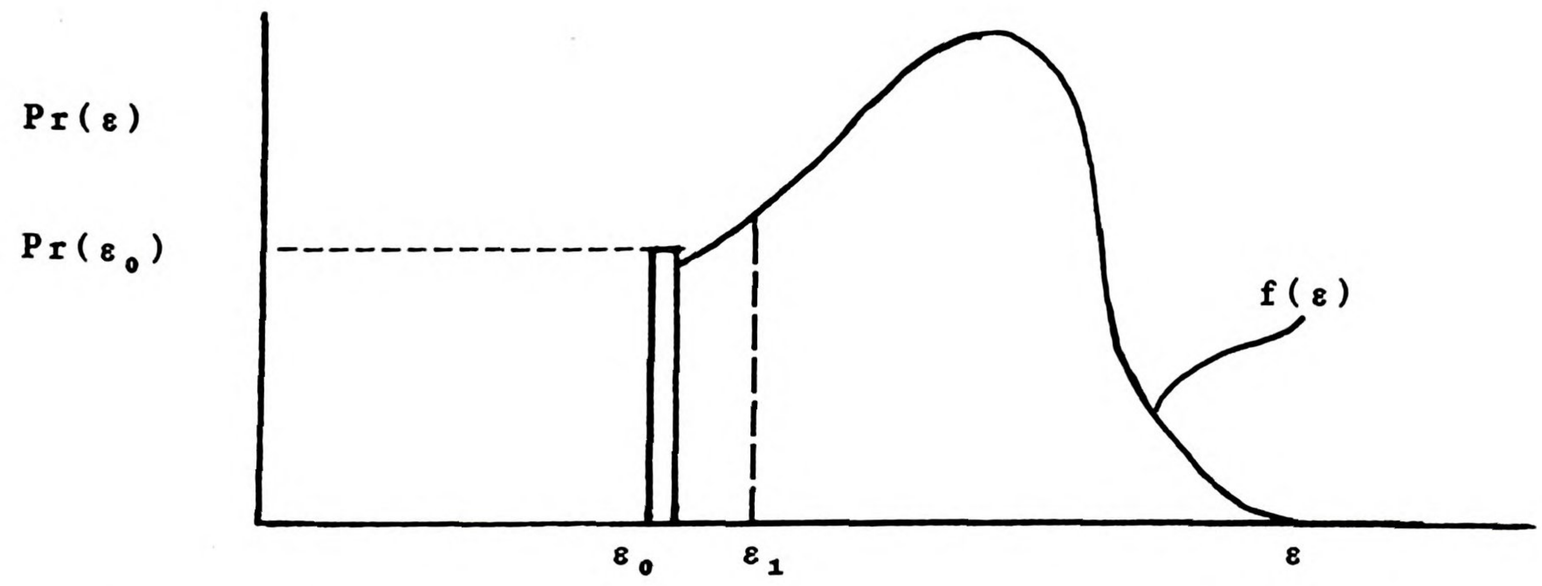

Figure 4-3 The Probability Density Function Illustrating the Credit Reserve Exhaustion: ε_1 Point

Because of the probability shift from the left hand tail of the PDF, the new distribution is absolutely less risky than the initial untruncated distribution for ε. In response to this decreased risk, the firm's optimal debt solution will be higher, reflecting both the firm's increased expected

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mean rate of return and reduced variance from the initial ε distribution. This increase in the expected mean value and reduction in variance increases the expected utility of the final impact distribution for the risk averse decision maker while increasing the probability the firm will go bankrupt (ε_0 shifted right).

In the event of a stochastic outcome at ε_1, the firm has exhausted its restricted credit reserve, $C_t^e = 0$. For random outcomes which occur between ε_1 but above ε_0, a firm in a deficit cash flow position does not have access to additional credit. In this situation, the firm is forced to undertake forced asset liquidation. As would be expected, the firm's critical bankruptcy expression for ε_0 is not affected by the introduction of the restricted credit reserve. With the incorporation of the restricted credit reserve, management is forced to exercise greater care in deciding between using available credit for the purchase of additional risky assets or maintaining a given level of credit reserve to handle unfavorable cash flow outcomes.

To solve for the ε_1 point, set the end-of-period credit reserve equal to zero and solve for E_{ε_1}

$$(4.8a) \quad (1-\rho)(1-\delta)(E_t^b + \hat{E}_{\varepsilon_1}) - \rho(D_t^b - \hat{E}_{\varepsilon_1}) = 0$$

Rearranging and collecting terms results in:

$$(4.8b) \quad (1-\rho)(1-\delta)\hat{E}_{\varepsilon_1} + \rho\hat{E}_{\varepsilon_1} = \rho D_t^b - (1-\rho)(1-\delta)E_t^b$$

and finally:

$$(4.8c) \qquad \hat{E}_{\varepsilon_1} =$$

Next, set the fi

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$$(4.9b) \qquad \varepsilon_1 =$$

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$$\frac{d\varepsilon_1}{dW} =$$

$$\frac{d\varepsilon_1}{d\rho} =$$

$$\frac{d\varepsilon_1}{di} =$$

$$\frac{d\varepsilon_1}{d\delta} =$$

and finally:

$$(4.8c) \qquad \hat{E}_{\varepsilon_1} = \frac{(\rho D_t^b - (1-\rho)(1-\delta)E_t^b)}{((1-\rho)(1-\delta)+\rho)}$$

Next, set the firm's cash flow equation expressed in terms of $\hat{E}$ equal to the credit reserve expression and solve for ε_1:

$$(4.9a) \qquad \frac{(\rho D_t^b - (1-\rho)(1-\delta)E_t^b)}{((1-\rho)(1-\delta)+\rho)} = (r+\varepsilon_1)(D_t^b+E_t^b) - iD_t^b - W$$

$$(4.9b) \qquad \varepsilon_1 = \frac{(\rho D_t^b - (1-\rho)(1-\delta)E_t^b)}{(((1-\rho)(1-\delta)+\rho)(D_t^b+E_t^b))} + \frac{(iD_t^b+W)}{(D_t^b+E_t^b)} - r$$

After substituting for the E_t^b and D_t^b expressions, the derivations of ε_1 can be obtained:

$$\frac{d\varepsilon_1}{dr} = -1 \qquad < 0$$

$$\frac{d\varepsilon_1}{dW} = \frac{1}{(D_{t-1}^e + X_2 - X_1 + E_{t-1}^e)} \qquad > 0$$

$$\frac{d\varepsilon_1}{d\rho} = \frac{(D_{t-1}^e + X_2 + E_{t-1}^e)^2(1-\delta)}{(1-\delta(1-\rho))(D_{t-1}^e + X_2 - X_1 + E_{t-1}^e)^2} \qquad > 0$$

$$\frac{d\varepsilon_1}{di} = \frac{(D_{t-1}^e + X_2 - (1-\rho)X_1)}{(D_{t-1}^e + X_2 - X_1 + E_{t-1}^e)} \qquad > 0$$

$$\frac{d\varepsilon_1}{d\delta} = \frac{(D_{t-1}^e + X_2 - X_1 + E_{t-1}^e)^2(1-\rho)\rho}{[(1-\delta(1-\rho))(D_{t-1}^e + X_2 - X_1 - E_{t-1}^e)]^2} \qquad > 0$$

$$\frac{d\varepsilon_1}{dX_1} = \frac{-i[(}{}$$

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$$\frac{d\varepsilon_1}{dX_1} = \frac{-i[(1-\rho)(D^e_{t-1} + X_2 + E^e_{t-1}) - (D^e_{t-1} + X_2)]}{(D^e_{t-1} + X_2 + E^e_{t-1})^2}$$

$$- \frac{\delta\rho(1-\rho)(D^e_{t-1} + X_2 + E^e_{t-1})}{[(1-\delta(1-\rho))(D^e_{t-1} + X_2 - X_1 + E^e_{t-1})]^2}$$

$$+ \frac{\rho(D^e_{t-1}+X_2)+W-(1-\rho)(1-\delta)E^e_{t-1}}{[(1-\delta(1-\rho))(D^e_{t-1}+X_2-X_1+E^e_{t-1})]^2} \quad < 0$$

$$\frac{d\varepsilon_1}{dX_2} = \frac{D^e_{t-1}(1+i) - i(1-\rho)X_1 - X_2 + E^e_{t-1} + W}{(D^e_{t-1} + X_2 - X_1 + E^e_{t-1})^2}$$

$$+ \frac{\rho[E^e_{t-1} - X_2 + (1-\rho)X_1]}{(1-\delta(1-\rho))(D^e_{t-1} + X_2 - X_1 + E^e_{t-1})^2} \quad > 0$$

$$\frac{d\varepsilon_1}{dE^b_t} = \frac{-(1-\delta(1-\rho)(D^e_{t-1}+X_2-X_1) + W(1-\delta(1-\rho))}{(1-\delta(1-\rho))\ (D^e_{t-1} + X_2 - X_1 + E^e_{t-1})}$$

$$- \frac{(\rho+i-i\delta(1-\rho))(D^e_{t-1}+X_2-(1-\rho)X_1)}{(1-\delta(1-\rho))\ (D^e_{t-1} + X_2 - X_1 + E^e_{t-1})} \quad < 0$$

$$\frac{d\varepsilon_1}{dD^b_t} = \frac{(1+i)(E^e_{t-1} - \rho X_1) - W}{(D^e_{t-1} + X_2 - X_1 + E^e_{t-1})^2} \quad \lessgtr 0$$

The sign on each of the ε_1 derivatives is unambiguous and is expected, with the exception of $d\varepsilon_1/dD^e_{t-1}$. In addition, the sign on the derivatives of ε_1 with respect to each variable is in the same direction as those obtained earlier for the ε_0 expression. With regard to the possibility of ambiguous results for the $d\varepsilon_1/dD^b_t$ expression, this derivative would be positive if the condition $(1+i)(E^b_t-\rho X_1) > W$ holds. This is a reasonable condition if $(1+i)(E^b_t-\rho X_1)$ is considered as an annuity and W reflects withdrawals from the

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firm's base investment and earnings. In order to maintain the investment base for future periods, the withdrawal must be less than or equal to the earnings rate.

4.5 Derivation of the Firm's Objective Function: Model II

Having now solved for both the firm's critical bankruptcy point ε_0, and the firm's restricted credit exhaustion point ε_1, we can rewrite the firm's objective function developed in Model I incorporating both of these equations and proceed to solve for the firm's decision variable, optimal debt. With the introduction of the ε_1 point, the PDF for ε_i outcomes is now divided into the regions: $\varepsilon_i < \varepsilon_0$, $\varepsilon_0 < \varepsilon_i < \varepsilon_1$, and $\varepsilon_i > \varepsilon_1$. Incorporating these three subdivisions into the expected utility equation results in:

$$(4.10) \quad EU(E_t^e) = \int_{-\infty}^{\varepsilon_0} [E_t^b + \hat{E}_{(\varepsilon_0)}]\, f(\varepsilon)\,d\varepsilon + \int_{\varepsilon_0}^{\varepsilon_1} [E_t^b + \hat{E}_{(\varepsilon_0)} - X_3]\, f(\varepsilon)\,d\varepsilon + \int_{\varepsilon_1}^{\infty} [E_t^b + \hat{E}_{(\varepsilon)}]\, f(\varepsilon)\,d\varepsilon$$

This initial expected utility equation can be simplified further by substituting for the forced asset liquidation variable, X_3, where X_3 equals:

$$(4.11) \quad X_3 = \frac{(\hat{E}_{(\varepsilon_1)} - \hat{E}_{(\varepsilon)})}{(1-\rho)}$$

Equation (4.11) can be simplified further and written as: $\hat{E}_{(\varepsilon)} = \hat{E}_{(\varepsilon)} - X_3(1-\rho)$. Substituting for E and rewriting

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(4.11), X_3 can be expressed as:

$$(4.12) \qquad X_3 = \frac{-(\varepsilon_1-\varepsilon)(D_t^b+E_t^b)}{(1-\rho)}$$

Finally, substitute (4.12) for X_3 into the expected utility equation (4.10).

Recognizing that the expected utility outcome from the PDF segment in the region $\varepsilon_i < \varepsilon_o$ results in bankruptcy, the firm's expected utility from this segment of the PDF interval is zero:

$$\int_{-\infty}^{\varepsilon_o} [E_t^b + \hat{E}_{(\varepsilon_o)}]\ f(\varepsilon)d\varepsilon = 0,$$

Based on these two substitutions, the initial expected utility equation (4.10) for Model II can be restated as:

$$(4.13) \qquad EU(E_t^e) = U(0) \int_{-\infty}^{\varepsilon_o} f(\varepsilon)d\varepsilon$$

$$+\int_{\varepsilon_o}^{\varepsilon_1} [E_t^b + \hat{E}_{(\varepsilon_1)} - (\varepsilon_1-\varepsilon)(D_t^b+E_t^b)\ /(1-\rho)$$

$$+\int_{\varepsilon_1}^{\infty} [E_t^b + \hat{E}_{(\varepsilon)}]\ f(\varepsilon)d\varepsilon$$

Next, substitute for the appropriate $\hat{E}_{(\varepsilon)}$ expressions in equation (4.13):

$$(4.14) \qquad EU(E_t^e) = U(0) \int_{-\infty}^{\varepsilon_o} f(\varepsilon)d\varepsilon + \int_{\varepsilon_o}^{\varepsilon_1} U[\bullet]\ f(\varepsilon)d\varepsilon$$

$$+\int_{\varepsilon_1}^{\infty} U[\bullet\bullet]\ f(\varepsilon)d\varepsilon$$

where

$$[\bullet] = E_t^b + r(D_t^b+E_t^b) + \frac{(\varepsilon-\varepsilon_1\rho)(D_t^b+E_t^b)}{(1-\rho)} - iD_t^b - W \qquad \text{for } (\varepsilon_o < \varepsilon_i < \varepsilon_1)$$

$$[\bullet\bullet] = E_t^b + (r+\varepsilon)(D_t^b+E_t^b) - iD_t^b - W \qquad \text{for } (\varepsilon_i > \varepsilon_1)$$

To solve for the firm's optimal debt position, we take

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the derivative of (4.14) to obtain first order conditions:

$$(4.15)\quad \frac{dEU(E_t^e)}{dD_t^b} = U(0)\frac{d\varepsilon_0}{dD_t^b} f(\varepsilon_0) - U(0)\frac{d\varepsilon_0}{dD_t^b} + U(\varepsilon_1)\frac{d\varepsilon_1}{dD_t^b}$$

$$+\int_{\varepsilon_0}^{\varepsilon_1} U'[\bullet]\left(r-i+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)} - \frac{(D_t^b+E_t^b)\rho(\partial\varepsilon_1)}{(1-\rho)\quad \partial D_t^b}\right) f(\varepsilon)d\varepsilon$$

$$-U(\varepsilon_1)\frac{d\varepsilon_1}{dD_t^b} f(\varepsilon_1)d\varepsilon$$

$$+\int_{\varepsilon_1}^{\infty} U''[\bullet\bullet](r+\varepsilon-i)\ f(\varepsilon)d\varepsilon = 0$$

Since the first and second terms in (4.15) equal zero and the third and fifth terms cancel, the equation can be simplified and expressed as:

$$(4.16)\quad \frac{dEU(E_t^e)}{dD_t^b} = \int_{\varepsilon_0}^{\varepsilon_1} U'[\bullet]\left(r-i+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)} - \frac{(D_t^b+E_t^b)\rho(\partial\varepsilon_1)}{(1-\rho)\quad \partial D_t^b}\right) f(\varepsilon)d\varepsilon$$

$$+\int_{\varepsilon_1}^{\infty} U'[\bullet\bullet](r+\varepsilon-i)\ f(\varepsilon)d\varepsilon = 0$$

Finally, to determine whether this expression will solve for the optimal beginning-of-period debt position for the firm, we take the second derivative of (4.16) with respect to debt and sign the expression:

$$(4.17)\quad \frac{d^2EU(E_t^e)}{dD_t^{b\,2}} = \left[\int_{\varepsilon_0}^{\varepsilon_1} \{U'[\bullet]\left(r-i+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)}\right)^2 - U'[\bullet]\frac{\partial\varepsilon_1}{\partial D_t^b}\frac{\rho}{(1-\rho)}\} f(\varepsilon)d\varepsilon\right.$$

$$\left.+\int_{\varepsilon_1}^{\infty} U''[\bullet\bullet](r+\varepsilon-i)^2 f(\varepsilon)d\varepsilon\right] dD_t^b \quad < 0$$

Examination of the signs on the various individual terms contained in (4.17) reveals that the sign of the second derivative is indeed negative, thereby supporting the belief that equation (4.14) will solve the expected end-of-period expected utility for the firm's a priori optimal debt

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An effort was made to sign the derivatives of the end-of-period expected utility expression with respect to each of the other variables. For each variable the result was ambiguous, illustrated here by the derivative with respect to the interest rate variable:

$$\frac{d^2 EU(E_t^e)}{di^2} =$$

$$-\left[\int_{\varepsilon_o}^{\varepsilon_1}\left\{U'[\cdot]\left(1+\frac{\rho\ \partial\varepsilon_1}{(1-\rho)\partial i}+\left(r-i+\frac{\varepsilon-\varepsilon_1\rho}{(1-\rho)}\right)U[\cdot]\left(D_t^b+\frac{\rho\partial\varepsilon_1}{(1-\rho)\partial i}\left(D_t^b+E_t^b\right)\right)\right\}f(\varepsilon)\,d\varepsilon\right.$$

$$\left.-\int_{\varepsilon_1}^{\infty} U'[\cdot\cdot]+(r+\varepsilon-i)U''[\cdot\cdot]D_t^b\ f(\varepsilon)\,d\varepsilon\right]di \quad <=> \quad 0 \quad ?$$

$$\frac{dD_t^b}{di} = \frac{(d^2 EU(E_t^e)/di^2)}{(d^2 EU(E_t^e)/dD_t^{b\,2})} = \frac{-(?)}{(-)}$$

The ambiguity of sign occurs because we do not know a priori the sign of strength of the $(r-i+(\varepsilon-\varepsilon_1\rho)/(1-\rho))$ term in the derivative of expected utility with respect to the interest rate. This same problem was encountered with each of the other derivatives. In an attempt to overcome this problem and to test the effect each variable has on optimal debt, Model II was operationalized and sensitivity analysis was conducted on a specific base model. The results of the sensitivity analysis are presented in the next section.

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exponential utility expression of the following basic configuration:

$$(4.18) \qquad EU(E_t^e) = \int_{-\infty}^{\infty} 1-e^{-\lambda E_t^e} \, f(\varepsilon)d\varepsilon$$

When the three segment PDF function for ε_i outcomes is incorporated with the negative exponential utility expression, the utility maximizing equation can be written as:

$$(4.19) \qquad EU(E_t^e) = 0\int_{-\infty}^{\varepsilon_0} f(\varepsilon)d\varepsilon + \int_{\varepsilon_0}^{\varepsilon_1} (1-e^{-\lambda E_t^e}) f(\varepsilon)d\varepsilon + \int_{\varepsilon_1}^{\infty} (1-e^{-\lambda E_t^e}) f(\varepsilon)d\varepsilon$$

Substituting for the E_t^e expression and differientiating with respect to beginning-of-period debt yields:

$$(4.20) \qquad \frac{dEU(E_t^e)}{dD_t^b} = \int_{\varepsilon_0}^{\varepsilon_1} \left[\lambda\left(r-i+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)}\right) e^{-\lambda[\bullet]} \right] f(\varepsilon)d\varepsilon$$

$$+\int_{\varepsilon_1}^{\infty} \lambda(r+\varepsilon-i)e^{-\lambda[\bullet\bullet]} \, f(\varepsilon)d\varepsilon + (0)\int_{-\infty}^{\varepsilon_0} f(\varepsilon)d\varepsilon = 0$$

To ensure that this debt solution will maximize the decision maker's expected utility, the second derivative of (4.20) was taken and the sign evaluated:

$$(4.21) \qquad \frac{d^2EU(E_t^e)}{dD_t^{b\,2}} = -\int_{\varepsilon_0}^{\varepsilon_1} \left[\frac{\lambda\partial\varepsilon_1 e^{-\lambda[\bullet]}}{\partial D_t^b} + \frac{\lambda^2\left(r-i+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)}\right)\partial[\bullet]e^{-\lambda[\bullet]}}{\partial D_t^b} \right] f(\varepsilon)d\varepsilon$$

$$-\lambda\left(r-i+\frac{(\varepsilon_0-\varepsilon_1\rho)}{(1-\rho)}\right)\frac{\partial\varepsilon_0}{\partial D_t^b} \, e^{-\lambda[\bullet]}$$

$$-\int_{\varepsilon_1}^{\infty} \left[\lambda^2(r+\varepsilon-i)e^{-\lambda[\bullet\bullet]}\frac{\partial[\bullet\bullet]}{\partial D_t^b} \right] f(\varepsilon)d\varepsilon \; < \; 0$$

sufficient conditions: $\left(r+\frac{(\varepsilon-\varepsilon_1\rho)}{(1-\rho)}\right) > i$ and $(r+\varepsilon-i) > 0$

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Given the unambiguous negative sign for the second derivative, based on the sufficient conditional statements, the result would maximize the decision maker's end-of-period wealth as illustrated in the next section.

4.6 Graphic Illustration of the Optimal Debt Solution

A simplified example can be used to illustrate the iterative optimization search routine used to solve for the firm's optimal debt solution, as illustrated in Figure 4-4.

The entire range of possible debt levels available to the firm is evaluated. The possible range of debt is bounded by the firm's beginning-of-period debt, D_t^b (or zero if the firm is debt free) on the low end, and the total of the firm's restricted credit reserve, C_t^b, and D_t^b or zero, on the top end. The firm's end-of-period expected utility is calculated for each of the possible ε outcomes. The $E(\varepsilon_i|D)$ outcomes are then averaged over the total number of ε observations for the average rate of return on the risky assets, r, to obtain E for each of the potential incremental levels of debt.

In Figure 4-4 the optimization process is graphically illustrated with use of two state variables (ε_1, ε_2) and two levels of debt (D_1, D_2). In this oversimplified example, debt level D_1, which is less than D_2, results in the higher expected end-of-period equity position, EU_1, for the firm. The optimal level of debt, D_1, in this example, is deter-

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mined to be optimal because it met the maximization condition for the derivative of expected utility with respect to debt:

$$\frac{dEU(E_t^e)}{dD_t^b} = 0$$

The expected utility from D_1, EU_1, exceeded EU_2, attributable to D_2. Each increment of available debt evaluated will result in the recalculation of the ε_0 and ε_1 values and will subsequently influence the firm's probability of bankruptcy and credit reserve exhaustion.

In the next section, Model II is operationalized in order to investigate empirically the marginal effect that varying each of the other variables will have on the firm's optimal debt.

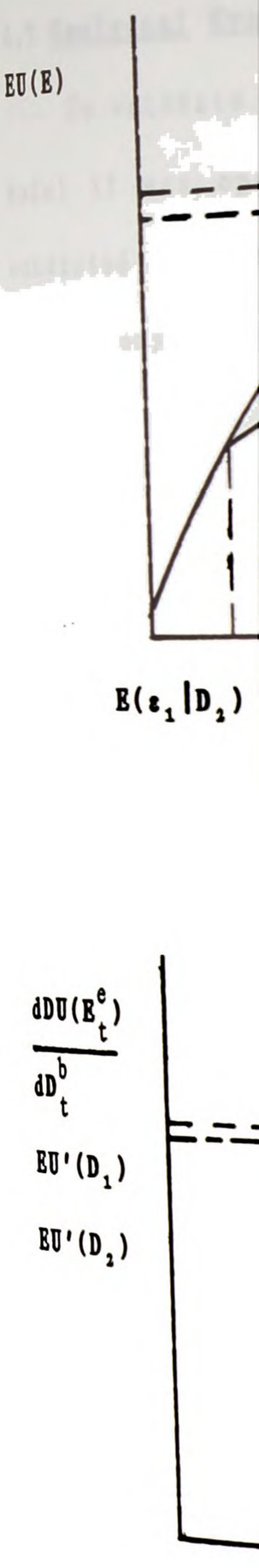

Figure 4-4

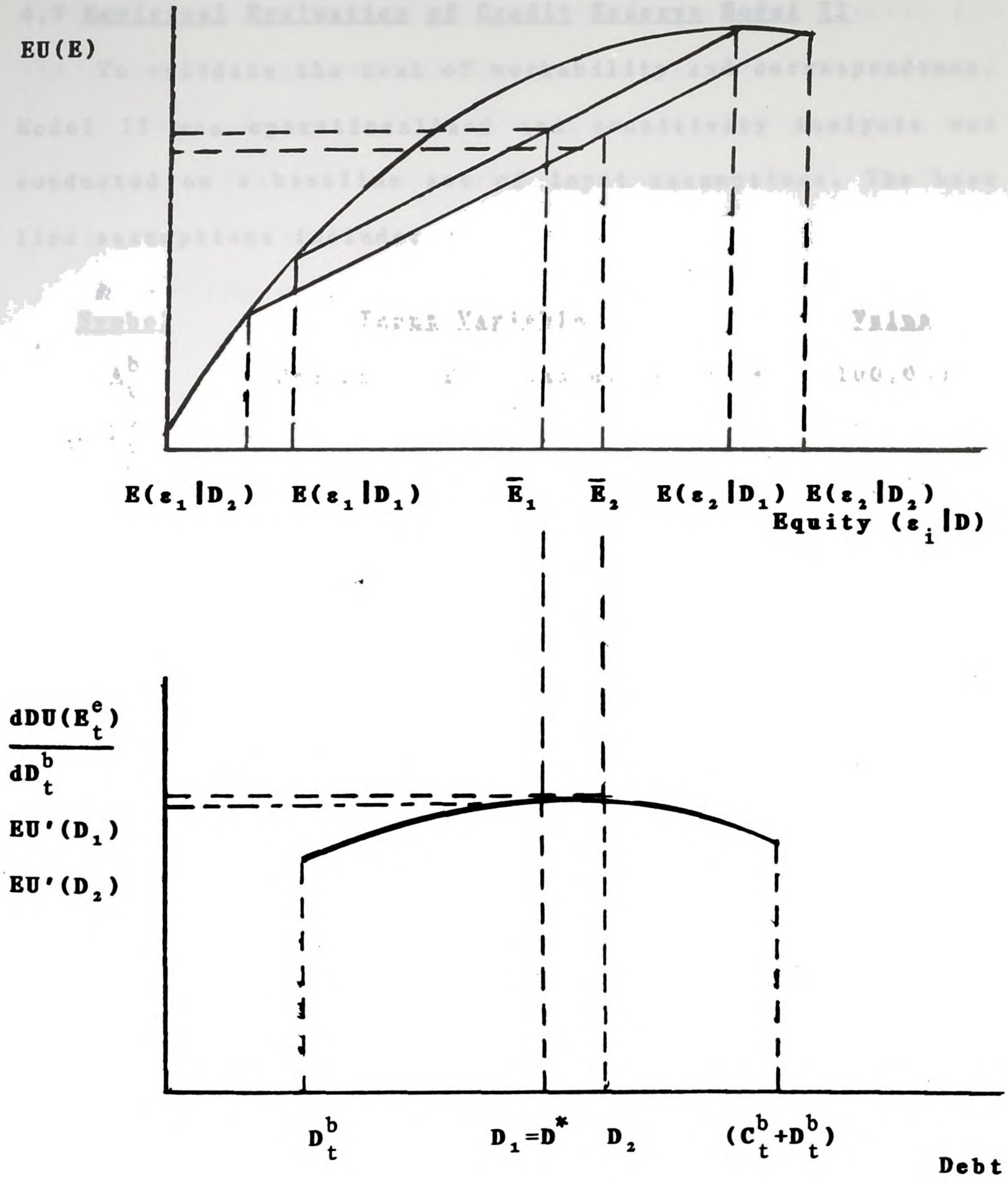

Figure 4-4 Illustration of the Iteratation Technique Used to Solve for the Firm's Optimal Debt Level Which Will Maximize End-of-the-Period Wealth

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4.7 Empirical Evaluation of Credit Reserve Model II

To validate the test of workability and correspondence, Model II was operationalized and sensitivity analysis was conducted on a baseline set of input assumptions. The base line assumptions include:

Symbol	Input Variable	Value
A_t^b	Beginning Total Asset Position	100,000
D_t^b	Beginning Total Debt	25,000
E_t^b	Beginning Equity Position	75,000
W	Exogeneous Cash Withdrawals	2,000
ρ	Liquidity Premium	.15
δ	Credit Policy Variable	.5
i	Interest Rate on Debt	.10
r	Average Expected Net Rate of Return before Interest Expense	.12
λ	Absolute Risk Coefficient	.00001

Based on the baseline assumptions the following maximum and restricted leverage ratios were determined.

$L_{max} = 5.67$ $\quad C_t^b = 400,000$

$L_{res} = 2.83$ $\quad C_t^b = 187,500$

In addition, the firm has a 400,000 dollar maximum credit reserve and a 187,500 dollar retricted credit reserve at the beginning of the period.

Five possible rates of return for r were used: .05, .07, .10, .16, and .22, with the stochastic term ε having a

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mean of zero and a variance of σ^2. The positive value for the absolute risk coefficient indicates that the decision maker is averse to risk. The assumption of a positive risk aversion coefficient is consistent with previous research findings for agricultural decision makers.

Given the initial deterministic and stochastic input parameters, the hypothetical firm's optimum debt position is 183,951 dollars. Based on the initial debt position of 25,000 dollars, the firm would maximize its end-of-period equity position if it were to acquire an additional 158,951 dollars of risky assets using 100 percent debt capital. With a beginning-of-period restricted credit reserve of 187,500 dollars, after the purchase of the additional assets the firm would have access to a restricted credit reserve of 28,549 dollars, which would serve as a liquidity buffer in the event of a possible deficit cash flow. The firm's optimal debt position (183,951) represents 86.6 percent of the firm's total debt capacity of 212,500 dollars (25,000 + 187,500).

It is important to note, however, that the firm could not absorb an operations deficit equal to the 28,549 dollars without incurring a deficit in restricted credit reserve at the end of the fiscal period. As a consequence of the dual but offsetting action of a deficit cash flow on both the firm's debt and equity accounts (refer to Table 4-1), the maximum operating loss the firm could incur while maintaining an end-of-period restricted credit reserve equal to zero

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is 7,448 dollars. The maximum operating loss ('MAXER') which the firm can experience before exhausting it's restricted credit reserve is determined by using equation (5). Equation (5) is repeated here as a convenience for the reader:

$$\text{MAXER} = \frac{(E_t^b - \rho\alpha)(1-\rho)(1-\delta) - \rho(D_t^b - (1-\rho)\alpha)}{((1-\rho)(1-\delta)+\rho)}$$

where $\alpha = [|C^b_{t,res}|/(1-\rho)]*2$

In the worst possible outcome, an operating loss of 31,851 dollars would force the firm into bankruptcy ($\varepsilon_i < \varepsilon_o$). This result was obtained by solving equation 4(4) for the baseline variable values.

Tables 4-1 and 4-2 present the model results from the sensitivity analysis for the firm's optimal debt solution based on the baseline parameters for selected percentage changes. As Table 4-1 highlights, there is nearly symmetric adjustment of the firm's optimal debt solution over the +/- 50 percent range for assets, debt and exogeneous cash withdrawals.

Sensitivity analysis on the equity account reveals that a 25 percent increase in equity, holding all other variables constant, resulted in a 25.9 percent increase in optimal debt from the baseline scenario, while a 25 percent reduction in the firm's equity reduced optimal debt by 20.1 percent.

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For the asset liquidation premium (ρ) and the lender's credit policy variable (δ), the optimal debt results were quite different. As shown in Table 4-2 a 50 percent reduction in the liquidation premium, ρ, from .15 to .075 increased the firm's optimal debt position from 183,951 dollars to 373,918 dollars. However, increasing ρ by 50 percent to .225 reduced the firm's optimal level of debt by 35.9 percent, from 183,951 to 117,886 dollars. The 50 percent reduction in ρ has nearly a 200 percent greater impact on the firm's optimal debt position than a 50 percent increase in ρ. Similar percentage changes in the δ variable yielded more symmetric percentage changes than with ρ, but with much less variability in the firm's optimal debt level.

Finally, the interest rate and expected net rate of return variables demonstrated equal but opposite rates of change in the firm's optimal debt strategy beyond a threshold level. For example, the base run analysis with a 10 percent interest rate resulted in an optimal debt level of 183,951 dollars. As the interest rate is increased, the level of optimal debt gradually declines, but stays within a relatively small percentage point range around the baseline result.

For the interest rate variable (holding all other variables constant), the debt usage threshold is 11.563 percent. Above that rate, the firm's optimal debt level declines to the initial debt position of 25,000 dollars.

Table 4-1 Sensitivity Analysis Utilizing Credit Reserve Model II

	ASSETS			DEBT			EQUITY			CASH WITHDRAWALS		
Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change
				$37,500b	$152,220	-17.25	$112,500	$279,143c,d	57.75	$3,000	$180,736	-1.75

Table 4-1 Sensitivity Analysis Utilizing Credit Reserve Model II

	ASSETS			DEBT			EQUITY			CASH WITHDRAWALS		
Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change
+50.0	$150,000a	$310,875c	69.00	$37,500b	$152,220	-17.25	$112,500	$279,143c,d	57.75	$3,000	$180,736	-1.75
+25.0	125,000	247,413c	34.50	31,250	168,087	- 8.62	93,750	231,547c	25.87	2,500	182,343	-0.87
+ 1.0	101,000	247,413	1.38	25,250	183,318	- 0.34	75,750	184,586	0.35	2,020	183,886	-0.04
Base Run	100,000	183,951	NA	25,000	183,951	NA	75,000	183,951	NA	2,000	183,951	NA
- 1.0	99,000	181,411	- 1.38	24,750	184,586	0.35	74,250	182,047	- 1.04	1,980	184,014	0.03
-25.0	75,000	132,212e	-28.13	18,750	199,815	8.62	56,250	146,981	-20.10	1,500	185,559	0.87
-50.0	50,000	62,669e	-65.93	12,500	215,682c	17.25	37,500	97,439	-47.03	1,000	187,167	1.75

Note: a) Holds Debt at $25,000; changes Equity
b) Holds Assets at $100,000; changes either Debt or Equity
c) Still less than the firm's Restricted Credit Reserve
d) Equity equals Assets when greater than $100,000
e) Optimal Debt is greater than Restricted Credit Reserve

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Above the threshold interest rate, which is defined as $i>(r+\varepsilon)$, the firm should minimize its use of debt because the cost of debt capital exceeds the expected net return on the firm's assets before interest payment.

The net rate of return variable yielded opposite results. Increasing the average expected net rate of return, r, results in a favorable (leftward) shift in the firm's ε_0 and ε_1 points. This leftward shift in ε_0 and ε_1 reduces the firm's probability of bankruptcy and lessens the likelihood that a deficit cash flow outcome will exhaust the firm's available restricted credit reserve. This is reflected in the fact that the firm's optimal debt strategy recommended the use of 100 percent of the firm's available restricted credit reserve for the purchase of additional risky assets.

The base run analysis confirmed the sign on all of the partial derivatives for both the ε_0 and ε_1 expressions. Because of the interactive complexity between the variables and the magnitude of the variables, caution must be used in drawing conclusions or extrapolating results that go much beyond the specific parameter values examined. Keep in mind that only one case example was presented in this paper. Additional simulation for different initial debt-to-equity ratios along with a larger number of stochastic rates of return would provide useful insight in developing credit reserve management strategies.

Table 4-2 Sensitivity Analysis Utilizing Credit Reserve Model II

	ROWE			DELTA			INTEREST RATE			AVERAGE RATE OF RETURN		
Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change
+50.0	.2250	$117,886	-35.91	.750	$ 98,570	-46.42	15.00	$ 25,000	-86.40	18.0	$212,500b	15.52

Table 4-2 Sensitivity Analysis Utilizing Credit Reserve Model II

	ROWE			DELTA			INTEREST RATE			AVERAGE RATE OF RETURN		
Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change	Variable Value	Optimal Debt	Percent Change
+50.0	.2250	$117,886	-35.91	.750	$ 98,570	-46.42	15.00	$ 25,000	-86.40	18.0	$212,500b	15.52
+25.0	.1875	145,072	-21.14	.625	142,567	-22.50	12.50	25,000	-86.40	15.0	212,500b	15.52
+ 1.0	.1515	182,079	- 1.02	.505	182,342	- 0.87	10.10	183,362	- 0.32	12.12	184,956	0.55
Base Run	.1500	183,951	NA	.500	183,951	NA	10.00	183,951	NA	12.00	183,951	NA
- 1.0	.1485	185,857	1.04	.495	185,556	0.87	9.90	184,544	0.32	11.88	182,956	- 0.54
-25.0	.1125	259,784	41.22	.375	222,944	21.20	7.50	212,500a	15.52	9.00	25,000	-86.41
-50.0	.0750	373,918	103.27	.250	259,753	41.21	5.00	212,500a	15.52	6.00	25,000	-86.41

Note: a) Maximum Credit Rreserve is less than the optimal debt but greater than the Restricted Credit Reserve

b) Optimal Debt is greater than Restricted Credit Reserve

ROWE = Liquidity Premium
DELTA = Lender's Credit Policy Variable

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Further, it should be noted that empirical evaluation of credit reserve Model II over a wide range of input parameter specifications produced simulated results which were consistent with Robison and Lev's risk preference reversal hypothesis. The risk preference reversal hypothesis states that a risk averse decision maker, if faced with increasing probability of business failure (bankruptcy), would select an optimal debt use strategy that called for still greater use of debt. The selection of increased debt in this situation is in response to the bankruptcy truncation point ε_0, (refer to Figure 4-1), accompanied by a possible increased mean expected rate of return and reduced variance of outcome due to the larger holding of risky assets. In summary, the decision maker's only chance for survival is to accept the additional debt and hope for a favorable stochastic outcome.

In the next section, the credit reserve model is used to empirically test for the possible occurrence of risk preference reversal by decision makers facing a high probability of bankruptcy.

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4.8 Risk Preference Reversal by Risk Averse Decision Makers

4.8.1 Introduction to the Risk Preference Reversal Hypothesis

During periods of increased financial stress and possible business failure, it has been observed that decision makers who are ordinarily disinclined to take risks undertake additional borrowing, in what can best be described as a risk preference financial behavior. An analogous example of risk preference reversal occurs regularly in the game of football. For example, when a normally conservative running team finds itself behind on the scoreboard with only seconds to play and no chance of running for the winning touchdown, the coach elects to throw a long pass into the end zone, gambling that one of the team's receivers will catch the ball and the team can snatch a win despite apparent defeat.

Robison and Lev introduced the concept of distinguishing between initial and final outcome variables as a means of explaining this observed behavioral transformation in decision makers normally averse to risk. The authors define the initial outcome variables as those variables 'which influence or are mapped into a final outcome variable, but which are not the outcome over which the decision maker defines his preference.' Failure to distinguish between initial and final outcome variables can lead to inaccurate conclusions concerning a decision maker's risk preference. The net cash flow variable, E, in the credit reserve model

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The authors demonstrated that it is the final outcome variable that influences the decision maker's risk preference. In the case of the two credit reserve models, the final outcome variable is the decision maker's end-of-period wealth (equity) position. Robison and Lev state that the final outcome variable should be the variable used as the argument for the von Neumann-Morgenstern utility function.

In the context of the credit reserve model, behavioral risk preference adjustment has been observed when a heavily leveraged firm, faced with increased probability of bankruptcy, proceeds to borrow additional debt. While the acquisition of additional risky assets with 100 percent debt financing will increase the probability of bankruptcy, the decision to purchase the assets may be the only means for the firm's survival.

Figure 4-5 shows the mapping of the initial and final outcome variables based on the initial debt level. Panel (a) in Figure 4-5 illustrates the mapping of the initial outcome variable, net cash flow, $\hat{E}$, for a firm facing bankruptcy, (ε_0) and credit reserve exhaustion, (ε_1), based on the firm's initial debt position. The expected value of the end-of-period equity ($\bar{E}_t^e$) and variance of the firm's equity position are highlighted in panel (a). As noted by Robison and Lev and discussed in detail with the credit reserve models, a firm's eventual loss of equity (wealth) due to

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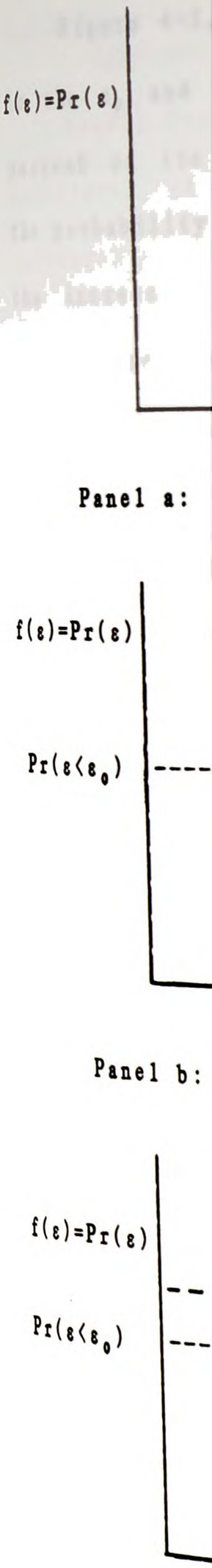
The initial impact distribution can then be mapped into the final outcome distribution with the cumulative probability of bankruptcy 'stacked' at the $E_{t-1}=0$ point. The mapping of the final outcome variable (equity) based on the firm's initial debt level is presented in Figure 4-5, panel (b). After the probability of bankruptcy has been summed at $E_t=0$ point, the new expected mean outcome, $\bar{E}^{*}_{t}$, is in absolute terms and is greater than the initial $\bar{E}_t$ point, while the adjusted variance of $\bar{E}^{*}_{t}$, σ^{2*} ,has been reduced as a result of truncating the PDF at ε_0. This theoretical outcome, reflecting a higher expected mean and reduced variance, explains why risk averse decision makers can be observed taking a risk preferring course of action.



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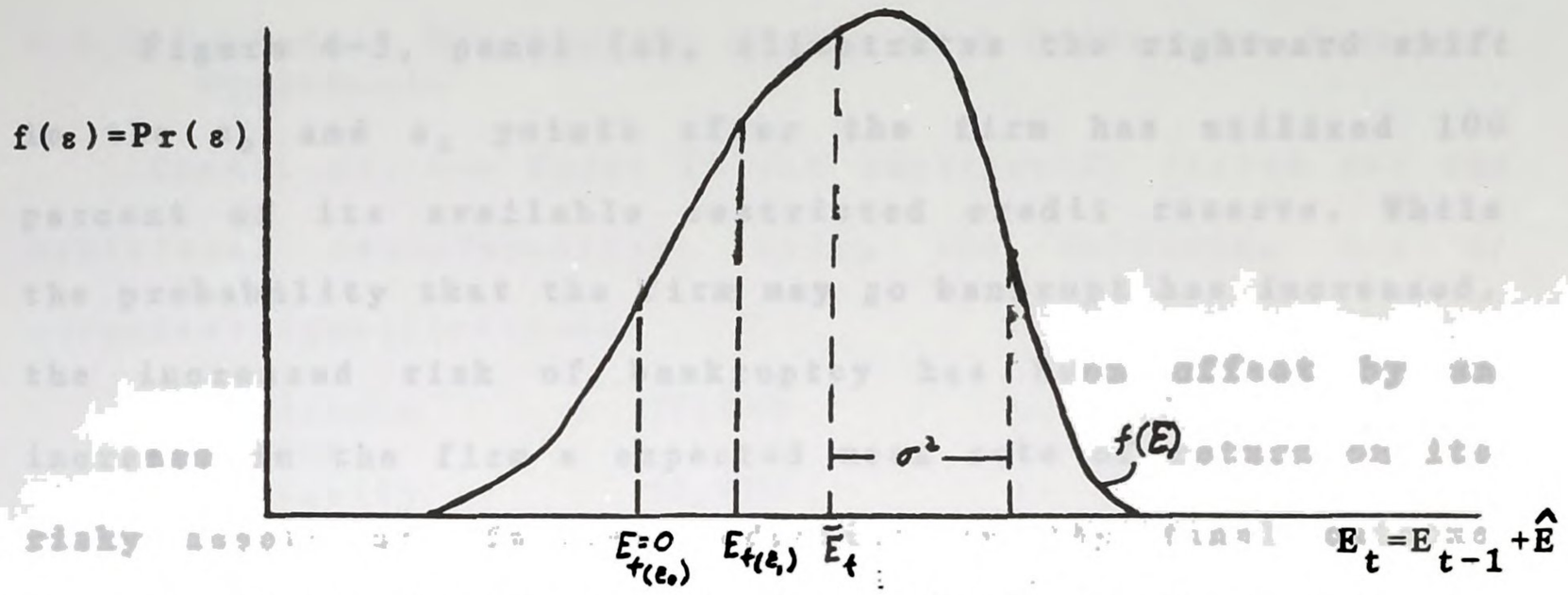
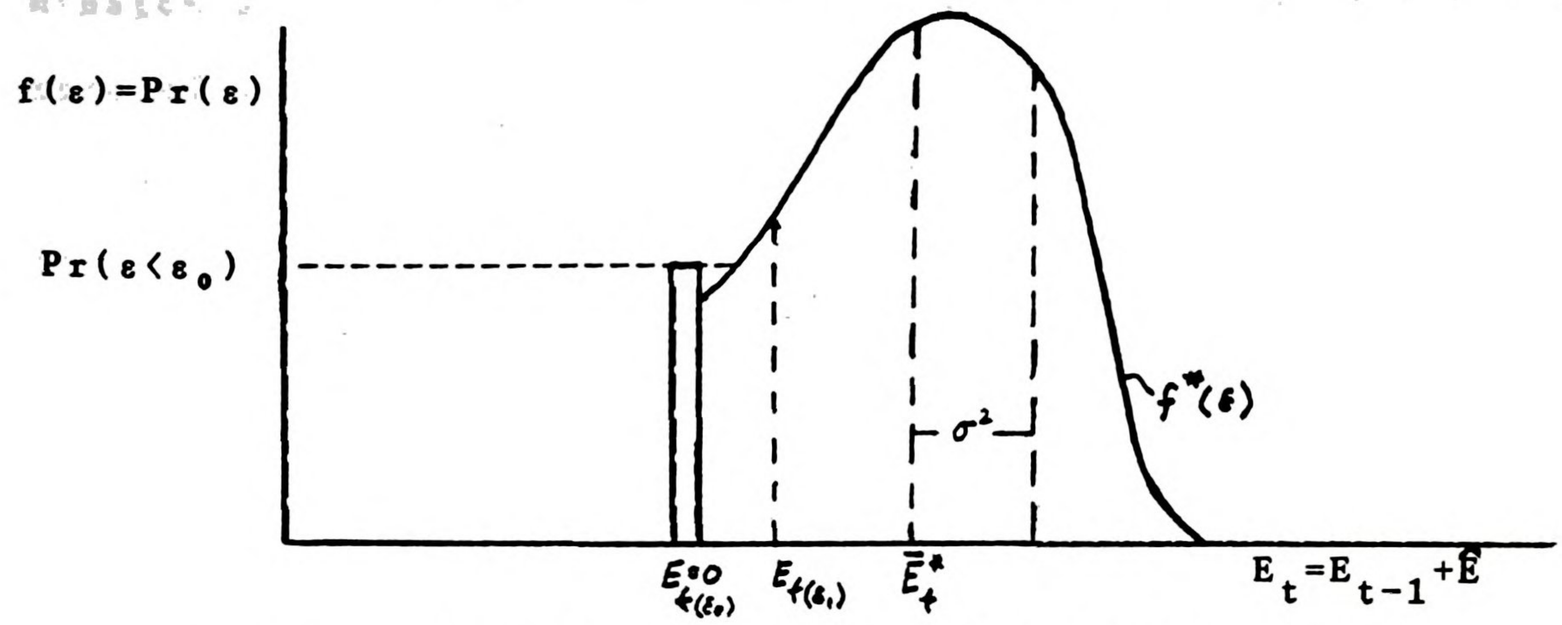
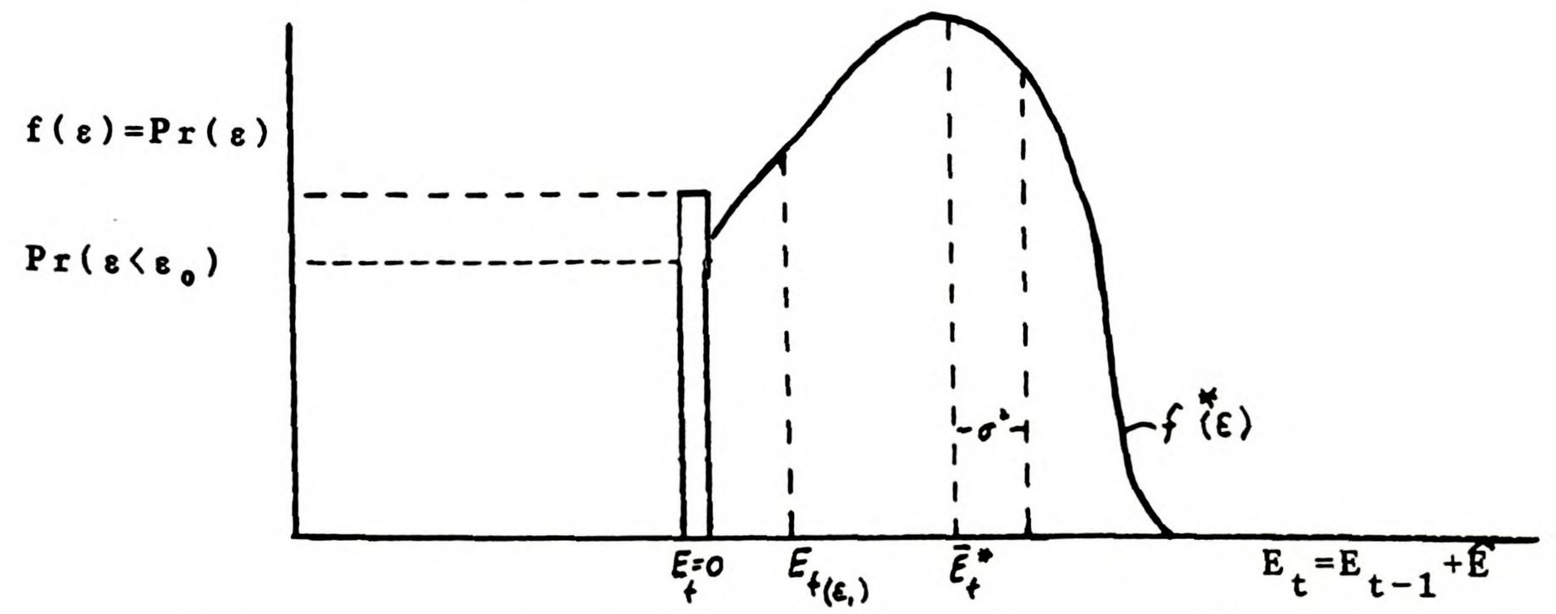


Panel a: Mapping of the Initial Outcome Variable at the Initial Debt Position



Panel b: Mapping of the Final Outcome Variable at the Initial Debt Position



Panel c: Mapping of the Final Outcome Variable After Utilizing 100 Percent of the Credit Reserve

Figure 4-5 Mapping Initial and Final Outcome Variables

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Figure 4-5, panel (c), illustrates the rightward shift in the ε_0 and ε_1 points after the firm has utilized 100 percent of its available restricted credit reserve. While the probability that the firm may go bankrupt has increased, the increased risk of bankruptcy has been offset by an increase in the firm's expected mean rate of return on its risky assets and further reduction in the final outcome variable's variance expression. At this point the firm's management is gambling on the possibility of a favorable net rate of return. Without a favorable outcome the financially stressed firm will likely go bankrupt, but, paradoxically, if the firm had not assumed the additional debt, there would have been an increase in the variance of the final outcome variable, and thus an increased likelihood of business failure.

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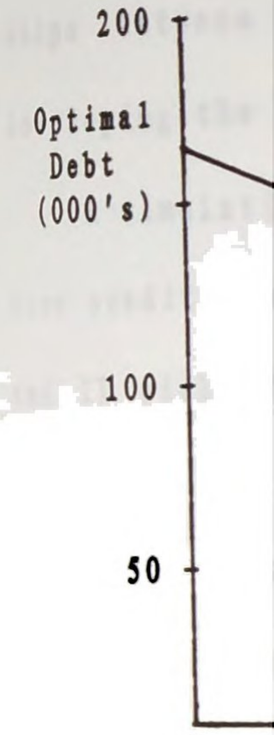
4.8.2 Empirical Examination of the Risk Preference Reversal Hypothesis

Credit reserve Model II was empirically tested for the behavioral transformation, using the following set of parameter specifications:

Assets	:	75,000	ρ:	.175
Debt	:	0	δ:	.5
Equity	:	75,000	i:	.105
Withdrawals	:	0	r:	.12
			λ:	.00001

The firm's optimal debt level based on these initial parameters, was 159,851 dollars. Then, to test for the risk preference reversal, cash withdrawals (W), were increased incrementally beginning at the initial value of zero up to 29,875. At the upper withdrawal level the firm's optimal debt level declined to 75,195 dollars. With a cash withdrawal of 29,875 dollars, the probability of bankruptcy rose to 20 percent, or 1 out of every 5th outcome for r. When cash withdrawals were increased to 30,000 dollars, the probability of bankruptcy rose to 40 percent and the firm's recommended optimal debt level increased to 176,786 dollars, 16,935 dollars (10.6 percent) higher than the optimal debt solution based on the initial zero debt assumption. The 176,786 dollar optimal debt level reflects the use of 100 percent of the firm's restricted credit reserve.



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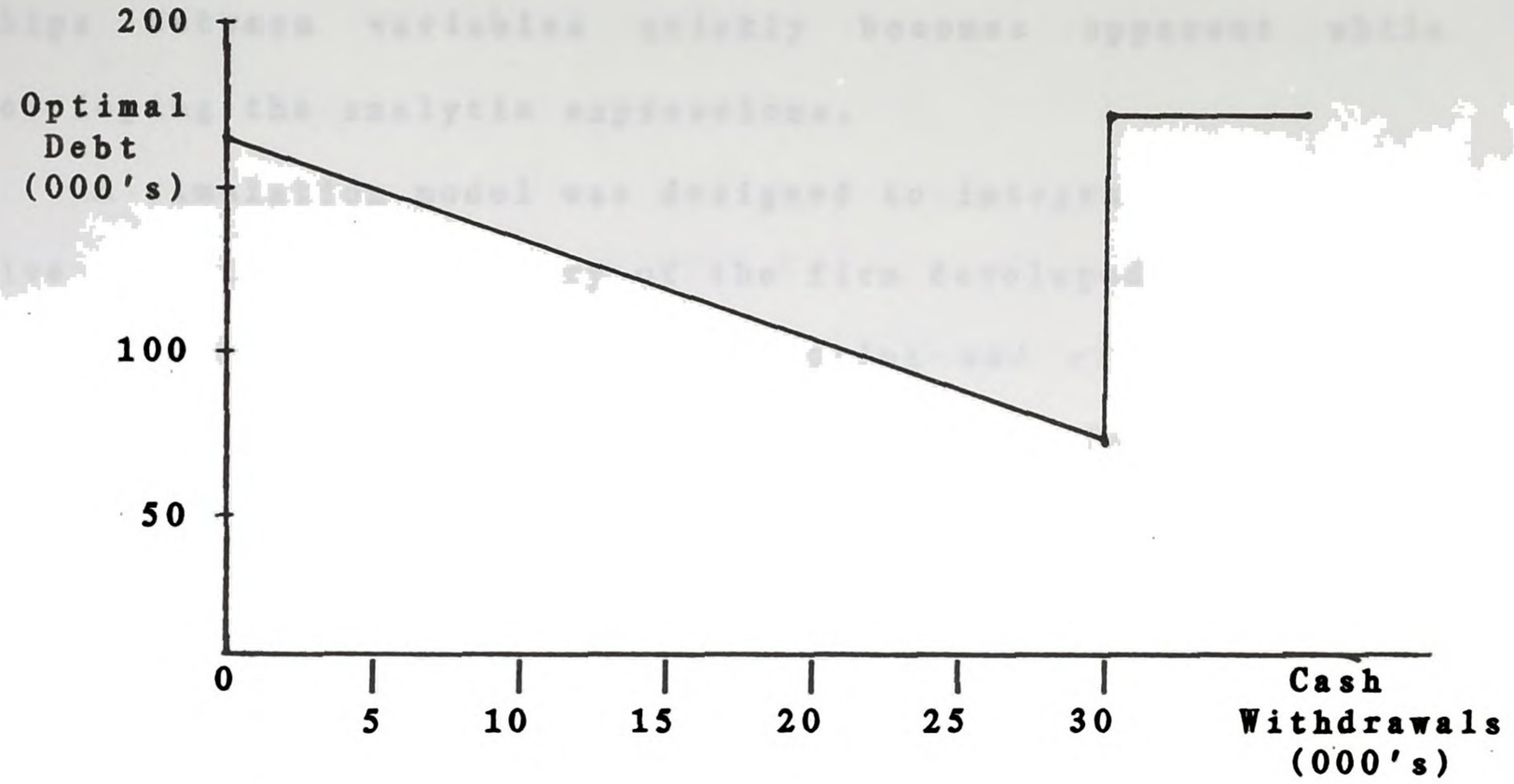

Figure 4-6 Illustration of the Risk Preference Reversal By a Firm Facing Increasing Probability of Bankruptcy

In summary, the optimal strategy for this ordinarily risk averse manager was to risk everything on the chance that the occurrence of one of the favorable random net rates of return would provide the firm with its only chance of avoiding bankruptcy. Figure 4-6 highlights the model's simulation results for testing the optimal debt level under increasing probability of bankruptcy.

4.9 Summary

This chapter presented the second of three rigorously defined deductive investment models, it permits the examination of such issues as financial stress, liquidity, credit management, and investment under risk for proprietary firms. While this second model built on the theoretical principles contained in Model I, the complexity of the interrelation-

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ships between variables quickly becomes apparent while developing the analytic expressions.

A simulation model was designed to integrate the deductive credit reserve theory of the firm developed in Models I and II with the production, marketing and risk management strategies of a typical midwest cash grain farm. The computer model provides for categorizing assets and liabilities into three groups -- current, intermediate and fixed/long term. In conjunction with this grouping of the balance sheet categories, the firm's credit reserve measurement is expanded to include eight credit reserve calculations: a maximum and restricted reserve for each category, along with integrated maximum and restricted credit reserve measures for the firm as whole.

A computer simulation model provides an efficient and timely means of incorporating the analytic complexities of financial and operational decision making under uncertainty. The computer simulation model is presented in chapter 5.

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CHAPTER 5

CREDIT RESERVE MANAGEMENT SIMULATION MODEL

5.1 Introduction

Agricultural producers find themselves in the midst of an increasingly uncertain economic environment, forcing decision makers to make increasingly complex financial and operational decisions. Unfortunately, at a time when many managers are in need of new approaches, the increasingly complex risk management decision making process has not lent itself to routine training or extension education programs. What is needed is a more sophisicated analysis format to assist managers in analyzing the impact of macro economic variables on their firms, while providing for interactive firm level analysis.

A systems approach, using computerized simulation models, which has been utilized quite successfully to portray the economic complexities facing the agribusiness sector while providing for sensitivity analysis of firm specific operational strategies. Rister noted that the 'systems approach facilitates the inclusion of the more important interdependent relationships existing in farm businesses while allowing for maintaining a distinction between endogenous and exogenous data and information.'

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A simulation model employing the systems approach can provide a format for communicating the intricacies of risk management decision making, and thus serve as an excellent training tool for agricultural decision makers. While previous farm management simulation models have been built to serve as research and teaching aides, the simulation model presented in this study is the first model to focus primarily on credit reserve management and the financial transactions of the agribusiness firm. Specifically, this simulation model is designed to incorporate the credit reserve theory of the firm presented in chapters 3 and 4 along with production, marketing and investment strategies for a typical midwest cash grain farm.

A simulation model may be designed to 'simulate the manager' or to 'simulate for the manager.' According to Ladue, 'a model designed for the study of management or management processes will usually be a model of a manager or possibly a game to be played by management.' Ladue states further that:

> a model 'of management' has limited usefulness to managers without the knowledge of what constitutes good management or poor management. Experience has shown that a model which provides the opportunity for the evaluation of management decision can be used in teaching management.
>
> Simulation models designed 'for management' span a broad spectrum in both size and topic covered. The primary purpose of these models is to provide managers with information about the firm or its environment which they did not previously possess. These models are generally designed to provide predictive data relative to a question of 'what if _____' or descriptive data relative to a

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> question of 'what is _____.' What if questions generally represent a request for information relative to a particular potential action.
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> The usefulness of models designed for management resides in their ability to provide information which allows managers to make better decisions or to improve the perspective of management relative to the operation of the business. These models do not teach management, rather, use of the model reveals principles or relationships to management.

The simulation model developed in this study is designed in a 'what if' context for management. The model provides the user with a limited number of alternatives, and the decision criteria for determining acceptable alternatives is considered exogenous to the model.

The model is designed to operate on an IBM PC microcomputer or one of the many IBM compatiblies currently available. The program's minimum hardware and RAM memory requirements for operation are similiar to the microcomputer system configurations currently found in the offices of a growing number of loan officers and farm managers. The model is designed for both extension and research application with particular design attention having been paid to its user interactive capabilities, ease of firm-specific data entry for sensitivity testing, internalized macro economic variable data strips, and error trapping features, allowing easy editing and data modification. A simulation model with these features provides an excellent pedagogical tool for

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incorporating the intricacies of firm level decision making with the latest advances in financial and economic theory, while maintaining a user-friendly interactive format.

5.2 Model Structure

5.2.1 System Configuration and Operating Considerations

This micro computer simulation model was written in Microsoft advanced BASIC. The program is designed to operate on either MS or PC-DOS operating systems with a minimum hardware configuration of 128K of RAM memory with one double-sided disk drive. Operation of the program from a hard disk will further increase the program's execution speed, compared to the input and output read/write time that would be required with a floppy disk drive.

The management reports generated by the program are formatted for viewing on the screen and for hard copy output. Hard copy reports are formatted for printing on 8.5 by 11 inch paper with either a dot matrix or letter quality printer. In addition, for ease of operation, the program disk contains a START.BAT file which will load both the BASIC program and the simulation model from either the 'A>' or the 'C>' prompt once the computer's disk operating system has been booted.[1]

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1. If computer with a hard disk is used for program operation, the START.BAT file should be selected from the hard disk directory where the BASIC program resides.

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5.2.2 Software Design

Because of Microsoft's BASIC program memory limitation of 64,000 bytes, the simulation model had to be designed in smaller modules. This enables execution of the program code while providing for enough addressable RAM memory within the BASIC program for data requirements. The model consists of a total of nine modules ranging in size from 1,200 to 41,000 bytes. Each module contains an average of 10 subroutines. Once program execution is started, all of the modules are linked together for uninterrupted program execution.

5.3 Model Overview

5.3.1 Summary of the Software Program's Modules

A number of alternative simulation models could have be specified and programmed to operationalize the theoretical approach to credit reserve management described in chapters 3 and 4. However, to integrate the farm firm's production, investment/disinvestment, risk management and family consumption activities with the lender's credit policies and loan criteria required development of a comprehensive set of complex mathematical relationships.

This chapter presents a brief discussion of the major program functions and mathematical relationships. For additional detail, Appendix A contains a detailed listing of the model's variables, including a listing showing in which module each variable first appears and whether the variable is inputted or calculated. Appendix B presents the model's

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Discussion of the simulation model is organized by major function or activity: therefore, it is useful at this time to briefly summarize the organizational structure of the model before proceeding with a more detailed description of the mathematical relationships and underlying assumptions. Figure 5.1 provides a flow chart of the modules and brief description of the model's modular design.

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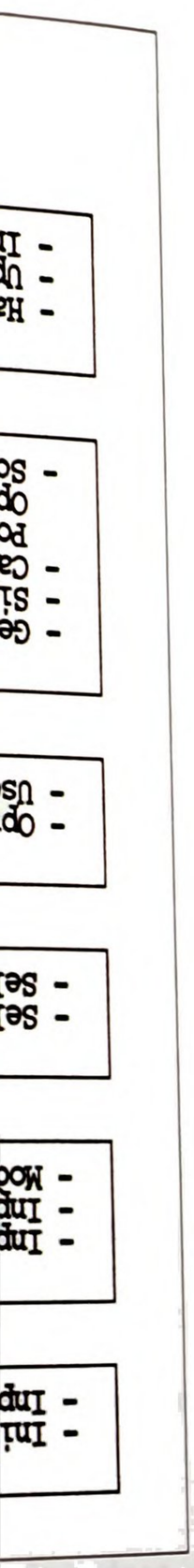
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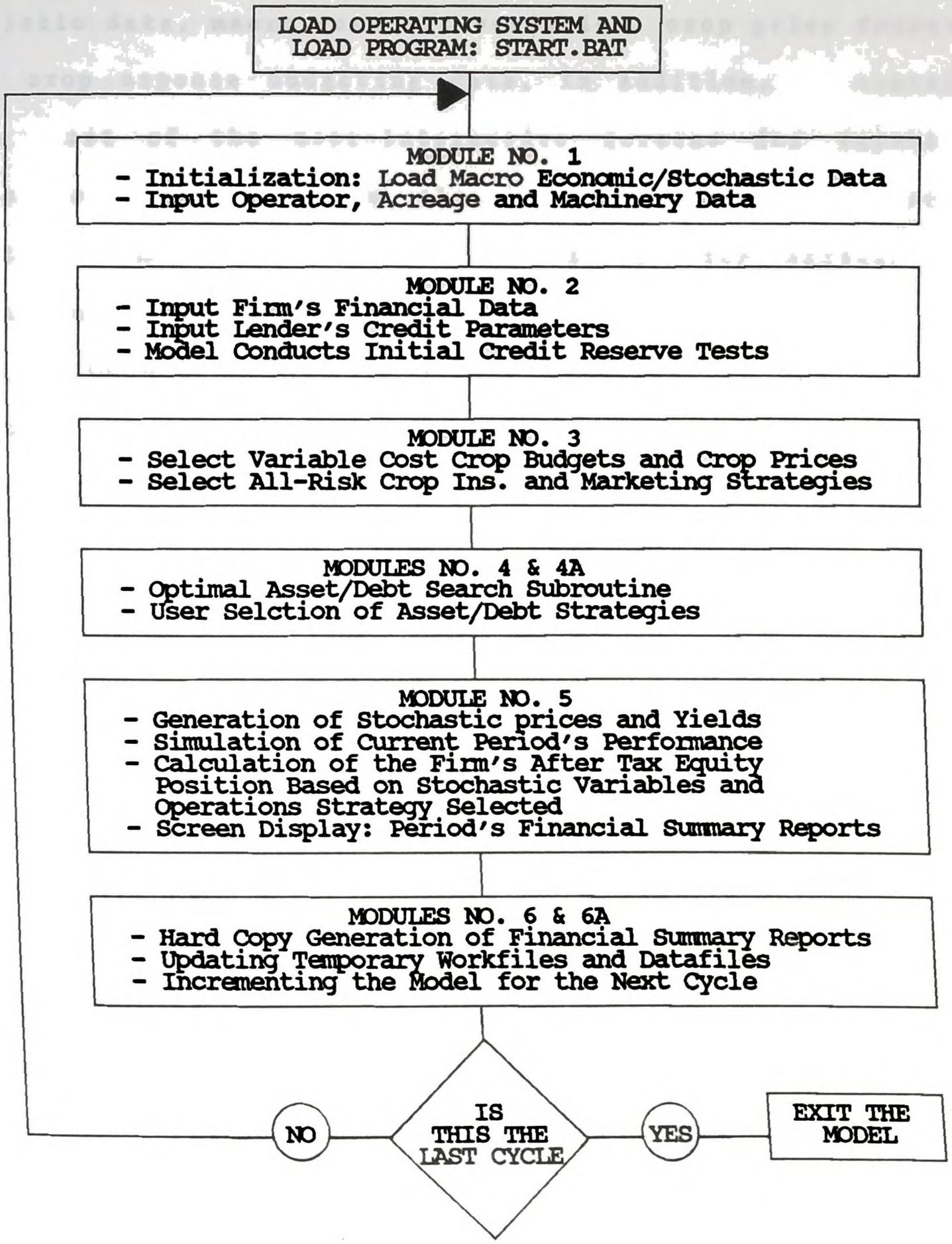

Figure 5-1 Flow Chart Summary of the Components of the Credit Reserve Simulation Model

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MODULE No.1: This initial module contains the model's initialization functions, including loading deterministic data, macro economic variables, crop price forcasts and crop expense budgeting data. In addition, it contains the first of the user-interactive screens for inputting specific information on the operator/family expenditure patterns, machinery management issues, crop acreage and financial data for the firm.

MODULE No.2: This module provides for the calculation of the required annual machinery purchases, balance sheet update equations, and credit reserve checks. In addition, it includes the lender interaction screen for inputting the credit variables and generates the firm's initial balance sheet.

MODULE No.3: This module contains the crop budgeting routine, inputting of the firm's fixed cash expenses, commodity pricing and yield routines, All-Risk Insurance routine and crop marketing strategy selection routine.

MODULE No.4: The optimization routine, involves evaluation of alternative machinery-to-land relationships given the firm's available resources, and a search for the ratio of machinery to land that will maximize the decision maker's end-of-period after tax wealth position. The search routine incorporates the decision maker's risk aversion characteristics, internal financial resources, probability of bankruptcy and available credit reserves within the expected utility hypothesis framework to search for the

firm's optimal

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MODULE No.4A: After the search routine has selected the optimal strategy from all possible combinations in module number 4, the user then has the option to select the simulation's optimal strategy, some part of it, or to remain at the firm's initial investment position. In addition, the decision maker has the opportunity to prepay the firms outstanding debt based upon the availability of cash. The firm's financial position and available credit reserves are then updated to reflect the decision maker's strategies.

MODULE No.5: Having decided upon the appropriate strategy for the next operating cycle, the firm's annual cash flow is then simulated with the introduction of yield and price risk. The end-of-year balance sheet is generated and credit reserves are recalculated.

MODULE No.6: Eight management reports can be generated, both on the screen and in hard copy, as desired by the user. If more than one cycle had been selected, the program proceeds to reinitialize the necessary equations and updates various macro data series before beginning the next cycle.

MODCOM: This module contains a complete listing of variables common to more than one module and the dimension statements of the variables.

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5.3.2 Software Program Operating Considerations and Summary of Potential Benefits for the User

The software program is designed so that it can be run with confidence by either a computer novice or an experienced computer user. The user is introduced to the program with the following information.

> Keep in mind that this program is a financial model, and as such must be both abstract and by necessity a simplification of reality. The results obtained are based on the strategies you select along with the economic assumptions the author built into the program.

The timing of all marketing and financial transactions and other key tactical and strategic decisions by the firm's management occurs as follows:

> Management decisions both tactical (day to day) and strategic (longer term) are assumed to take place on only two days of the year. Those two days include December 31st, when the firm closes out its operating year and prepares its financial and income statements, and January 1st when it is assumed the firm's management has an appointment to visit its primary lender(s). The focus of the meeting with the firm's major creditors is twofold:
>
> 1) To permit the lenders to review the firm's financial performance during the past year and make any necessary changes to the lender-controlled credit variables.
>
> 2) To outline the firm's proposed operating and capital investment budgets for the coming year.

Once the firm's primary lender(s) have established the firm's credit reserves for the coming year, the firm's management can then use the available intermediate and real estate credit reserves for operating and investment purposes. It is assumed that 100 percent of the production

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input loan request is approved, independent of the operating credit reserve established by the lender. However, the firm's total available credit is influenced by how the firm decides to invest in machinery and land.

Finally, before proceeding with the actual operation of the model, the program presents the user with a summary of the potential benefits to be derived from taking the time to work with the computer model. The benefits listed include:

1) Increased understanding of the interaction between key macro economic and financial variables on the firm's optimal strategy for financial growth over a planning horizon of up to ten years

2) Capability to simulate alternative production, marketing and all risk insurance strategies and evaluate their combined impact on the financial performance of the farm firm

3) Opportunity to examine a wide range of asset acquisition proposals, along with assessing the financial impact of alternative financing arrangements on the firm's available credit reserves

4) Introduction to the capability of micro computers as a management tool to aid agricultural decision makers in their analysis of increasingly complex economic issues

The internal logic of the computer model provides for the evaluation of the firm's available cash position before each of the production and capital investment decisions are made. As a result, the firm's available cash position relative to required cash down payment for equipment and real estate purchases, land lease payment requirements, and so on, along with internal credit reserve checks imposes a number of potiential resource constraints on the firm.

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5.4 Financial Accou

5.4.1 Balance Sheet

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Date

1. 12/31/87

2. 1/01/88

3. 1/01/88

4. 12/31/88

With regard to grain marketing, the model assumes that the entire inventory of grain is marketed as of December 31st of each year. This simplifing assumption was incorporated into the model to avoid complicating the analysis with year-end tax management strategies.

5.4 Financial Accounting and the Value of the Firm

5.4.1 Balance Sheet Accounting Format

The computer model balance sheet for the firm has been greatly expanded from the single asset and single liability balance sheet utilized to develop the theoretical relationships presented in chapters 3 and 4. Both a market value and a modified cost basis balance sheet for the firm are updated at each of the strategic management decision points throughout the model. The balance sheet is updated at a minimum four times, including:

Date	Description
1. 12/31/87	- After initial financial data entry and credit reserve checks
2. 1/01/88	- After lender(s) has reviewed prior period financial performance and modified credit policy variables
3. 1/01/88	- After capital investment and crop production decisions are made
4. 12/31/88	- After the production results for the fiscal year are complete

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The balance sheet accounting format was developed using a format similar to that presented in Penson and Lins' book. An example of the balance sheet format and asset and liability categories is presented in Table 5-1. While in practice lenders and farmers often disagree on the value to be placed on the firm's assets, this model assumes that the farmer's values are accepted by the lender.

The balance sheet format includes entries for the value of rented land and the total value of owned and rented acreage. These entries deviate from generally accepted agricultural financial statements. The value of rental acreage is included for informational purposes because it is used in the search routine for determining the optimal machinery to total tillable land value ratio.

Contingent tax liabilities for intermediate and real estate assets are calculated based on the provisions of the 1986 tax law revisions. The new tax law eliminated the 60 percent capital gains exclusion and requires that 100 percent of the capital gain be taxed at the firm's marginal tax rate.

Further, the model assumes that if the decision maker leases crop acreage, 50 percent of the total lease payment must be paid from available cash on January 1st with the balance of the lease payment listed as a current liability-lease payable. Payment of the lease payable is due on December 31st of the year, when the model calculates net income

Table 5-1 Samp

YEAR END BA

ASSETS	
CURRENT ASSETS	
- Cash/Cash Equivalent	
- Prepaid Land Lease	
TOTAL CURRENT ASSETS	
INTERMEDIATE ASSETS	
- Machinery and Bldg.	
- Cost Basis	
- Acc. Dep.	
- Book Value	
TOTAL INTERMEDIATE ASSET	
REAL ESTATE	
- Acres= 400	
TOTAL OWNED ASSETS	
---	---
VALUE OF RENTED LAND	
- Acres= 250	
VALUE OF RENTED and OWNI	
---	---
LIABILITIES AND NET WOR	
CURRENT LIABILITIES	
- Operating Loan (12	
- Current Port. Inter	
- Current Port. Long	
- Land Lease Payable	
TOTAL CURRENT LIABILIT	
INTERMEDIATE LIABILITI	
- Machinery/Bldg. lo	
- Contingent Tax on	
TOTAL INTERMEDIATE LIA	
LONG TERM LIABILITIES	
- Real Estate Mortga	
- Contingent Tax on	
TOTAL LONG TERM LIABI	
TOTAL LIABILITIES	
NET WORTH	

Table 5-1 Sample Balance Sheet Report

YEAR END BALANCE SHEET: 12-31-86

ASSETS	**MODIFIED COST**	**MARKET VALUE**
CURRENT **ASSETS**		
- Cash/Cash Equivalent	$75,000	$75,000
- Prepaid Land Lease	5,000	5,000
TOTAL CURRENT ASSETS	80,000	80,000
INTERMEDIATE ASSETS		
- Machinery and Bldg.		
- Cost Basis $226,000		175,000
- Acc. Dep. 100,000		
- Book Value -------	126,000	
TOTAL INTERMEDIATE ASSETS	126,000	175,000
REAL ESTATE		
- Acres= 400	300,000	500,000
	---------	---------
TOTAL OWNED ASSETS	$506,000	$755,000
VALUE OF RENTED LAND	N/A	250,000
- Acres= 250		
VALUE OF RENTED and OWNED LAND	$300,000	$750,000
LIABILITIES AND NET WORTH		
CURRENT LIABILITIES		
- Operating Loan (12 mo or less)	$45,000	$45,000
- Current Port. Inter. Debt	20,000	20,000
- Current Port. Long Term Debt	10,000	10,000
- Land Lease Payable	5,000	5,000
TOTAL CURRENT LIABILITIES	80,000	80,000
INTERMEDIATE LIABILITIES		
- Machinery/Bldg. loan	100,000	100,000
- Contingent Tax on Inter. Assets	N/A	25,000
TOTAL INTERMEDIATE LIABILITIES	100,000	125,000
LONG TERM LIABILITIES		
- Real Estate Mortgage	128,000	128,000
- Contingent Tax on Land	N/A	15,000
TOTAL LONG TERM LIABILITIES	128,000	143,000
TOTAL LIABILITIES	308,000	348,000
	---------	---------
NET WORTH	$198,000	$407,000

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5.4.2 Sources and Us

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5.4.2 Sources and Uses of Cash Statement

Management of the firm's liquidity, and in particular its cash position, is one of the most important tasks performed by the firm's decision maker. The Sources and Uses of Cash Statement provides the decision maker with a summary of the firm's financial activities for the fiscal period. Simulation models that make use of deterministic average prices and yields oversimplify the dynamic nature and uncertainty associated with management of the firm's cash flow. Management of a firm's available liquidity, both cash and available credit, takes on increased importance when random commodity prices and yields, along with the introduction of the probability of bankruptcy, are considered in the firm's decision making process. All of these factors are integrated into the simulation model.

The computer program generates a Sources and Uses of Cash Statement for the decision maker after both capital investment and production decisions have been made and the model has simulated commodity prices and yields for the coming fiscal period. During the decision making process the computer model provides the decision maker with both on-screen and hard copy reports highlighting intermediate decision analysis results. The intermediate results available to the decision maker include: expected net margin per

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acre for corn and soybeans, the firm's aggregate cash flow exposure for each crop, and the impact that each operational and capital investment decision has on the firm's credit reserve position. A sample Sources and Uses of Cash Statement (with sample data) is presented in Table 5-2.

It should be noted that the Sources and Uses of Cash Statement does not include the beginning-of-period cash, or any of the operating loan proceeds. The purpose of this statement is to summarize the firm's actual cash flow for the year. The change in the firm's cash position can be determined by comparing the initial balance sheet for the period with the ending balance sheet.

Finally, the Sources and Uses of Cash Statement provides the decision maker with a summary of forced asset sales (if any). Forced asset liquidation will occur when the firm has exhausted its restricted credit reserve and is still in a deficit cash position for the period. Refer to section 4.2.3 for a detailed discussion of forced asset liquidation.

Table 5-2 Sample

SOURCES AND
CASH RECEIPTS FROM OP
OTHER FARM INCOME . .
CAPITAL ASSET SALES .
NON-FARM INCOME . . .
NEW DEBT BORROWED . .
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Table 5-2 Sample Sources and Uses of Cash Report

SOURCES AND USES OF CASH STATEMENT: 1986

SOURCES OF CASH

CASH RECEIPTS FROM OPERATIONS	$325,000
OTHER FARM INCOME	20,000
CAPITAL ASSET SALES	65,000
NON-FARM INCOME	12,000
NEW DEBT BORROWED	125,000
TOTAL CASH AVAILABLE:	$547,000

USES OF CASH

TOTAL CASH OPERATING EXPENSES	$255,000
CAPITAL ASSET PURCHASES	150,000
INTERMEDIATE AND LONG TERM PRINCIPAL AND INTEREST PAYMENTS . .	105,000
TAXES AND SOCIAL SECURITY	6,500
FAMILY LIVING WITHDRAWAL	14,200
NON-FARM CASH WITHDRAWAL	500
ASSET LIQUIDATION EXPENSES	1,200
TOTAL CASH REQUIRED:	$532,400

NET CASH POSITION (deficit): $14,600

FORCED ASSET LIQUIDATION: $0

5.5 Credit Reserves a

5.5.1 Introduction

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5.5 Credit Reserves and Credit Policy Variables

5.5.1 Introduction

The credit reserve equations and lender credit policy variables incorporated into the simulation model represent a major expansion of the credit reserve equations and the credit policy variables developed in the deductive theory models presented in Chapters 3 and 4. The deductive theory models were restricted to single asset and single liability expressions for mathematical purposes. The computer simulation model permits expansion from the single asset and single liability assumptions contained in Models I and II to a more realistic, three-asset and three-liability category balance sheet for the firm, with a total of eight credit reserve expressions.

The simulation model provides for a maximum and restricted credit reserve expression for each of the current, intermediate and real estate asset categories. In addition to the credit reserve expressions for each individual asset category, the simulation model provides for computation of the firm's overall maximum and restricted credit reserves. The overall, or weighted, credit reserve expressions provide the decision maker with an aggregrate assessment of the firm's total credit reserve position. The decision maker is provided with credit reserve information before and after production and investment decisions are made, allowing an assessment of the financial impact of each decision on the individual asset and liability categories as

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well as the firm as a whole. For example, the decision maker can immediately assess the financial implications to the firm if he/she decides to purchase additional real estate with a combination of available cash and real estate credit. The obvious impact would be a reduction in the firm's real estate credit reserve. However, secondary impacts include a reduction in the firm's intermediate credit reserve as a result of the need to purchase additional equipment to farm the additional acreage. The firm's current asset credit reserve would be reduced if the decision maker is required to make a cash down payment from the firm's available cash for the purchase of the additional machinery and real estate. Finally, the firm's weighted maximum and restricted credit reserves will also be reduced. Most agricultural decision makers and their lenders are not well informed as to how particular production or investment decisions, such as purchasing additional land to expand the firm's production capacity, affect the firm's total credit reserve position.

5.5.2 Credit Policy Variables

The simulation model expands on the two credit policy variables contained in credit reserve Model II by providing for a total of seven variables, including:

Delta, δ:	Lender's Credit Policy Variable for each asset category
Rowe, ρ:	Liquidity Premium for each asset category
MINCR:	Creditor-imposed Minimum Credit Reserve Requirement to be maintained at all times

IN: Nomina
for th
CASHDP: The Ca
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TERM: Term
MINRATIO: Minim
asset

Each of the current
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5.5.3 Mathematical
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$$\rho_w =$$

where

ρ_w =
ρ_1 =
ρ_2 =
ρ_3 =
D_x =

E_x =
D_t^x =
E_t =

IN: Nominal Interest Rate charged by the creditor for the debt category
CASHDP: The Cash Down payment Percentage required for the purchase of additional assets
TERM: Term Of Loan offered by liability category
MINRATIO: Minimum Acceptable Current Ratio (current assets to current liabilities)

Each of the current, intermediate and long term liability categories have six credit policy variables. The MINRATIO pertains only to the minimum acceptable ratio between the firm's current assets and liabilities. The credit policy variables are first entered by the user during the initial deterministic data entry routine and can be subsequently adjusted at the beginning of each additional operating cycle.

5.5.3 Mathematical Derivation of the Firm's Weighted Liquidity Premium and Financial Leverage Credit Policy Variables

The weighted liquidity premium, ρ_w, for the three-asset category firm was mathematically derived by first expressing the basic liquidity premium relationship for each of the firm's three asset categories as follows:

$$\rho_w = \frac{\rho_1(D_1+E_1) + \rho_2(D_2+E_2) + \rho_3(D_3+E_3)}{(D_t+E_t)} \tag{5.1}$$

where

ρ_w = Firm's Weighted Liquidity Premium
ρ_1 = Current Asset Liquidity Premium
ρ_2 = Intermediate Asset Liquidity Premium
ρ_3 = Real Estate Asset Liquidity Premium
D_x = Total Debt By Category, Where x=1 is Current Liabilities, 2= Intermediate and 3= Long Term Liabilities Respectively
E_x = Total Equity By Asset Category
D_t^x = Firm's Total Debt in Time Period (t)
E_t^t = Firm's Total Equity in Time Period (t)

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$$(5.2) \qquad (D_2+E_2)$$

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Equation (5.3) can

$$(5.4) \qquad \rho_w = \frac{(}{}$$

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$$(5.5) \qquad D_3 =$$

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simplify:

$$(5.6) \qquad \rho_w = \frac{(D_t+E_t}{}$$

$$+ \frac{\rho_2 \eta_1 L}{(D_t+E}$$

The relationship between the firm's intermediate and real estate assets can be expressed as:

$$(5.2) \qquad (D_2+E_2) = \eta_1(D_3+E_3+L)$$

where

L = Total Value of Rented Acreage

Equation (5.2) can be rewritten as

$$\eta_1 = \frac{(D_2+E_2)}{(D_3+E_3+L)}$$

Substituting equation (5.2) for the firm's total intermediate assets into equation (5.1) results in:

$$(5.3) \qquad \rho_w = \frac{\rho_2\eta_1(D_3+E_3+L) + \rho_1(D_1+E_1) + \rho_3(D_3+E_3)}{(D_t+E_t)}$$

Equation (5.3) can be simplified and rewritten as:

$$(5.4) \qquad \rho_w = \frac{(\rho_2\eta_1+\rho_3)(D_3+E_3) + \rho_2\eta_1 L + \rho_1(D_1+E_1)}{(D_t+E_t)}$$

Recognizing that $(D_2+E_2) = \eta_1(D_3+E_3+L)$, equation (5.4) can be rewritten as a function of D_3:

$$(5.5) \qquad D_3 = \frac{(D_t+E_t) - (D_1+E_1) - (1+\eta_1)E_3 - \eta_1 L}{(1+\eta_1)}$$

Now substitute the expression for D_3 into equation (5.4) and simplify:

$$(5.6) \quad \rho_w = \frac{(D_t+E_t)((\rho_2\eta_1+\rho_3)(((D_t+E_t)-(D_1+E_1)-(1+\eta_1)E_3-\eta_1 L)+E_3))}{(1+\eta_1)} + \frac{\rho_2\eta_1 L+\rho_1(D_1+E_1)}{(D_t+E_t)}$$

Finally, multiplyin

tion (5.6) by $(1+\eta_1$

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three-asset categor

(5.7) ρ_w =

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(5.8) δ_w =

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Finally, multiplying the numerator and denominator of equation (5.6) by $(1+\eta_1)$ and simplifying results in the following expression for the weighted liquidity premium for the three-asset category firm:

$$(5.7) \qquad \rho_w = \frac{(\rho_2\eta_1+\rho_3)((D_t+E_t)-(D_1+E_1)-\eta_1 L)}{(1+\eta_1)(D_t+E_t)} + \frac{\rho_2\eta_1 L + \rho_1(D_1+E_1)}{(D_t+E_t)}$$

The lender's weighted credit policy variable, δ_w, was derived utilizing the same procedure as was used for ρ_w. Substitute δ for ρ in equations (5.1) through (5.7). The weighted leverage expression for the three-asset category farm firm is:

$$(5.8) \qquad \delta_w = \frac{(\delta_2\eta_1+\delta_3)((D_t+E_t)-(D_1+E_1)-\eta_1 L)}{(1+\eta_1)(D_t+E_t)} + \frac{\delta_2\eta_1 L + \delta_1(D_1+E_1)}{(D_t+E_t)}$$

The weighted liquidity premium and the weighted leverage ratio expressions for the three asset category firm are utilized in the firm's maximum and restricted credit reserve equations.

5.5.4 Maximum and Restricted Credit Reserves

The maximum and restricted credit reserve expressions for each asset category and the firm's weighted maximum and restricted credit reserve equations in the model were

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developed based on the credit reserve equations contained in credit reserve Model II, but were expanded to include the influence of income taxes, real estate leasing and cost basis accounting. For example, the restricted credit reserve expression for fixed assets (real estate) is:

$$(5.9)\quad CRDRESR.L = \frac{((1-ROW.L)*(1-DEL.L))}{ROW.L} * EQTPOS.L - DBT.L$$

where

CRDRESR.L = Real Estate Restricted Credit Reserve
ROW.L = Real Estate Liquidity Premium
DEL.L = Lender's Real Estate Credit Policy Variable
EQTPOS.L = Market Value Real Estate Equity
DBT.L = Total Real Estate Debt

The firm's real estate maximum credit reserve expression is:

$$(5.10)\quad CRDRESM.L = \frac{(1-ROW.L)}{ROW.L} * EQTPOSM.L - (DBT.L+CCGT.L)$$

where

CRDRESM.L = Real Estate Maximum Credit Reserve
EQTPOSM.L = Market Value Real Estate Equity Adjusted For Contingent Tax Liability
CCGT.L = Contingent Capital Gains Tax on Real Estate

While the credit reserve expressions for the intermediate and current asset categories are similiar to the real estate equations, there are slight structural differences. The intermediate asset category in the simulation model consists exclusively of equipment for the farm firm. The intermediate asset maximum credit reserve expression, like the real estate maximum credit reserve expression, provides for contingent tax liability. For the current asset credit reserve expressions, the structural differences include inclusion of real estate lease payables and the

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5.5.5 Verificat
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Table 5-3 summa

portion of intermediate and real estate debt due within the year.

The firm's weighted maximum and restricted credit reserve expressions are theoretically consistent with the structure of the individual asset category expressions contained in Model II, but with the substitution of the weighted liquidity and financial leverage expressions for the single asset liquidity and leverage expressions. The firm's weighted restricted credit reserve is:

$$(5.11) \quad CRDRESR.W = \frac{((1-ROW.WEO)*(1-DEL.WEO))}{ROW.WEO} * TEQTPOS.M - TDBT.M$$

where

CRDRESR.W = Firm's Weighted Restricted Credit Reserve

ROW.WEO = Weighted Liquidity Premium

DEL.WEO = Weighted Lender Credit Policy Variable

TEQTPOS.M = Total Market Value Equity

TDBT.M = Total Debt Owed Creditors and IRS

Finally, the firm's weighted maximum credit reserve expression can be expressed as:

$$(5.12) \quad CRDRESM.W = \frac{(1-ROW.WEO)}{ROW.WEO} * TEQTPOS.M - TDBT.M$$

5.5.5 Verification of the Firm's Credit Reserves For Compliance With Credit Policy Variables

The firm's credit reserves are calculated, updated and verified for compliance with the lender's credit policy parameters five times during a simulated operating cycle. Table 5-3 summarizes the schedule for credit reserve cal-

culation and compl

cycle.

Table 5-3 Schedul
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	Credit Reser
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2.	After the pu required to
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4.	After simul for the pro living with
5.	After the f period fina ments to in variables a

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Table 5-3 Schedule for Credit Reserve Calculation and Verfication During Production Period

	Credit Reserve Calculation/Verification	Date
1.	After entry of initial financial and deterministic data for the farm firm	12/31/87
2.	After the purchase of replacement machinery required to maintain production capability	1/01/88
3.	After making production decisions with regard to total crop acreage, additional machinery investment to improve production capability, All-Risk Crop Insurance, and related management decisions	1/01/88
4.	After simulation of the firm's cash flow for the production cycle, tax payment, family living withdrawal and scheduled debt payments	12/31/88
5.	After the firm's creditors have reviewed prior period financial performance, and adjustments to interest rates and/or credit policy variables are made for the next period	1/01/89

During the credit reserve update process each of the firm's eight credit reserve measures are recalculated and verified. The logic used for verification and compliance with each of the lender's specific credit policy parameters involves an extensive iterative process that begins with the intermediate credit reserve and proceeds to the real estate and then current credit reserve. In the event one or more of the firm's credit reserves is not in compliance, the program examines such options as refinancing real estate debt, and the liquidation of machinery and real estate.

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The following example illustrates the logic built into the model's credit reserve verification process. At the beginning of the planning cycle, the program calculates the machinery purchase required to replace that portion of the firm's equipment investment that was depreciated during the last production cycle. The firm is required to maintain the ratio of equipment to real estate that existed the previous period. The firm's intermediate credit reserve is first evaluated to determine whether adequate funds are available to finance the required machinery purchase less the cash down payment portion of the purchase price.[2] Assuming that the firm's intermediate credit reserve is adequate, the model then tests to see if the firm has cash available to make the required down payment. If the cash is available, the model proceeds with the required machinery purchase. If there is not enough cash, the model checks to see if the firm's current credit reserve is adequate to supply the liquidity required. If the current asset credit reserve is insufficient, the program then checks to see if the firm owns real estate and if the farm's real estate mortgage has been refinanced within the last three years. If the firm owns land and has not refinanced the mortgage within three years then the cash required is generated through the real estate refinancing option. Refinancing costs the firm 500

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2. The model is designed to accommodate up to 100 percent debt financing of machinery and real estate purchases if the lender does not require an equity investment (cash down payment) in the asset being purchased.

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dollars for filing and processing costs and an additional 5 percent of the required capital. In addition, the option to refinance the mortgage in the future is eliminated for a period of three years. Finally, in the event the firm has refinanced the real estate mortgage within three years the only option left is to sell enough real estate to generate adequate cash to purchase the machinery necessary to replace the equipment depreciated last period.

In summary, the program proceeds through a set of operational options for the decision maker that are very similiar to those the manager would encounter in the day-to-day operation of the farm firm.

5.6 Debt Management

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5.6 Debt Management in the Model

There are a number of assumptions built into the model's debt accounting and management functions, including:

- Interest and principal payments are assumed to be made annually on 12/31/xx each period. This assumption is made because the model is an annual model and because many crop producers utilize annual installments on their intermediate and long-term debt.

- Intermediate and Long-Term debt interest payments for the period are calculated within the model as follows:

(5.13)
$$INDBT.I = DBT.I * IN.I$$
$$INDBT.L = DBT.L * IN.L$$

where

INDBT.I = Total Intermediate interest for the period
INDBT.L = Total Long-Term interest for the period
DBT.I = Total Intermediate Debt as of 1/1/xx
DBT.L = Total Long-Term Debt as of 1/1/xx
IN.I = Average interest rate on Intermediate Debt
IN.L = Average interest rate on Long-Term Debt

- Intermediate and Long-Term Debt principal payments for the period are calculated within the model as follows:

(5.14)
$$CP.I = (1/TERM.I) * DBT.I$$
$$CP.L = (1/TERM.L) * DBT.L$$

where

CP.I = Intermediate Principal Payment due this period

CP.L = Long-Term Principal Payment due this period

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TERM.I = Term of Intermediate Loan
enter in years and tenths
i.e. 7.5 = seven and a half
years

TERM.L = Term of Long Term Loan
enter in years and tenths
i.e. 21.5 = twenty and a
half years

-In the event that surplus cash is available the user has the opportunity to accelerate the payment of principal. This action will result in reduced principal payments in subsequent cycles based on the formula for CP.I and CP.L.

-The user has the opportunity at the start of each planning period to modify the interest rates and other key credit policy variables to reflect changing economic conditions imposed on the firm by lenders.

-Availability of credit is assured at the firm level, with access to credit determined by the lender's credit policy variables and the firm's initial financial position, operational performance and subsequent investment decisions.

-The firm is assumed to have access to all operating loan credit required for crop production within the firm's overall financial constraints.

5.7 Machinery Management Relationships

5.7.1 Introduction

Timely and cost efficient farming of owned and rented land requires access to well maintained and up-to-date field machinery. It is assumed in this model that the only method of obtaining the use of machinery is through ownership; leasing of equipment is not an alternative. The ratio of machinery investment to the value of owned and rented till-able, acreage and how these assets are financed, are the key

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factors in solving the objective function for the optimum solution. This model does not differentiate between different types of equipment; rather, the machinery component is handled in terms of dollars invested per acre.

Skees notes that there are distinct advantages and disadvantages associated with this approach to machinery investment and accounting. The primary advantage, according to Skees, is one of operational simplicity. That is, it is not necessary to develop and enter large amounts of data in the initial year. The primary disadvantage, Skees notes is the loss of the 'lumpiness' in year-to-year expenditures on machinery. This results from not having to replace a specific major piece of equipment such as a combine or large tractor, but rather a calculated dollar amount. Further, use of the investment per acre approach requires the simplifying assumption that the entire equipment complement wears out at a constant rate over time. The model assumes a 20 percent annual depreciation rate.

Use of this methodology results in a much smoother year-to-year required expenditure for replacement equipment than would be observed in reality. The investment per acre assumption, in most cases, will overstate the firm's planned equipment investment in the year following a year of poor financial performance.

The model provides the user with the option to select between two machinery strategies -- a maintenance strategy and a growth strategy. The maintenance strategy is ap-

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propriate for the 'mature' firm; that is, for a firm managed by a decision maker who is either nearing the end of the growth phase or entering the exit phase of the farm life cycle. At this stage in the family farm life cycle, the manager has realized most of his goals, especially those related to expansion of the business. The maintenance option would therefore provide the firm with a stabilized machinery investment, adjusted for price inflation, for the required year-to-year machinery replacement requirement.

The growth strategy, on the other hand, provides the decision maker with an investment strategy designed to accommodate expected future growth in the firm's total crop acreage. This more aggressive strategy is designed to simulate the decision maker's desire to obtain state-of-the-art equipment complete with the latest technology in an effort to achieve the potential higher yield per acre that can be realized through improved operational efficiency and improved timeliness in the field. The higher fixed costs associated with the machinery inventory would be offset by a combination of reduced variable costs associated with routine maintenance expense and increased yield per acre.

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5.7.2 Derivation of Machinery Investment and Accounting Equations for Maintenance Strategy

To initiate the machinery valuation and investment component for the maintenance machinery replacement strategy, the user must input the market and book value of the firm's machinery. Then the model the user must identify the number of years that the maintenance strategy has been followed.

Managers are generally familiar with the market value of their equipment. This results from their need to assign a value to their machinery inventory each year for balance sheet preparation. The machinery's book value is also readily available to the user; it can be obtained from the firm's tax depreciation schedule. In the event the user does not enter the equipment's book value, the model will calculate a book value based on the market value and the parameters set forth in equation (15).

After the user has selected the maintenance strategy and the number of years that the firm has pursued that strategy, the model assigns a cost-basis-to-market-value ratio value and a cost-basis-to-book-value ratio value for the firm. In the event that the user does not specify the number of years (T), the model will set T=1. Table 5-4 summarizes the cost-basis-to-book-value and the cost-basis-to-market-value ratios used in the model for both the maintenance and growth machinery replacement strategies for an 11 year planning period.

Table 5-4 Ratios
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Table 5-4 Ratios of the Relationship Between the Firm's Machinery Cost-Basis-to-Book-Value and Cost-Basis-to-Market-Value for the Maintenance and Growth Machinery Replacement Strategies

PERIOD NUMBER	MAINTENANCE		GROWTH	
	CBBVM	CBMVM	CBBVG	CBMVM
1	1.000	1.000	1.000	1.000
2	1.165	1.119	1.089	1.065
3	1.327	1.232	1.180	1.131
4	1.483	1.340	1.274	1.199
5	1.633	1.443	1.369	1.267
6	1.775	1.540	1.466	1.267
7	1.910	1.635	1.564	1.335
8	2.047	1.732	1.662	1.474
9	2.167	1.816	1.744	1.543
10	2.280	1.896	1.814	1.612
11	2.386	1.972	1.877	1.680

The program estimates the cost basis of the firm's machinery inventory based on two factors: the machinery's market value, which is entered by the user during the initial data entry, and the the number of years the firm has been pursuing the current strategy (eg. the 'T' value). Based on the 'T' selected, the program selects the appropriate cost-basis-to-market-value ratio from Table 5-4 and estimates the cost basis for the machinery inventory utilizing (5.15).

$$MECB = MEMV * CBMV(M,T) \quad (5.15)$$

where

MECB = Cost basis of the machinery component

MEMV = Market value of the machinery component

CBMV(M,T) = Ratio of MECB to MEMV for the maintenance replacement strategy

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In the event the user does not enter a book value for the equipment inventory, the model will estimate the machinery's book value as follows:

$$(5.16) \qquad MEBV = MECB * \frac{1}{CBBV(M,T)}$$

where

MEBV = Machinery book value

MECB = Machinery cost basis

CBBV(M,T) = Ratio of MECB to MEBV for the maintenance replacement strategy

The model then calculates the required machinery investment for replacement purposes for the next planning cycle:

$$(5.17) \qquad ASSETP.IR = \frac{(MEMV * INFLA(CYCLE) * DEPRATE)}{(\ 1 + DEPRATE\ )}$$

where

INFLA(CYCLE) = GNP deflator for the current period

DEPRATE = Rate of machinery depreciation (set at 20 percent)

5.7.3 Derivation of Machinery Investment and Accounting Equations for Growth Strategy

The growth strategy for machinery replacement is very similar to the maintenance strategy. The cost basis and book value of the firm's machinery are estimated with equations similiar to (5.15) and (5.16). CBMV(G,T) is substituted for CBMV(M,T) in (5.15) and CBBV(G,T) is substituted for CBBV(M,T) in (5.16), respectively.

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5.8 Voluntary and Estate

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The required annual machinery investment under the growth strategy is calculated utilizing (5.18):

$$(5.18)\quad ASSETP.IR = \frac{MEMV}{\left\{\frac{1}{DEPRATE} - \frac{(1 + DEPRATE)^{-T}}{DEPRATE}\right\} + 1} * INFLA(CYCLE)$$

5.8 Voluntary and Forced Liquidation of Machinery and Real Estate

5.8.1 Intoduction

The simulation model expands on the single-asset voluntary liquidation concept, under the assumption of imperfect capital markets, as discussed with Model II in Chapter 4. The computer program evaluates the possible need for voluntary asset liquidation for each of the three asset classes, at the following stages of the planning process:

1. During the updating of the firm's credit reserves for compliance with the lender's credit policy parameters
2. During the program's optimization routine
3. Voluntary liquidation of machinery and real estate by the decision maker as a means to reduce the firm's exposure to financial risk

Under the assumption of imperfect capital markets, voluntary liquidation of the firm's assets is not a cost-free activity. The decision to liquidate any class of assets results in increased costs of operation. The cost of liquidation is a function of the liquidity premium, ρ, for each asset class, ranging from a very small ρ for cash and cash equivalents to the highest ρ for farmland and specialized

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fixed structures. The greater the liquidity premium, the greater will be the reduction in the value of the firm's total assets when voluntary liquidation occurs. This occurs because for each dollar required to balance a minimum credit reserve, $(1+\rho)$ dollars must be liquidated.

The model assumes that the firm is required to repay that portion of a liability which corresponds to the debt-to-asset ratio for the particular asset class at the time of the sale. The debt repayment requirement generally is a prerequisite required by lenders to obtain a legal release of a secured asset, necessary prior to a sale.

5.8.2 Voluntary Asset Liquidation

The firm will encounter the possibility of voluntary asset liquidation primarily during two phases of the planning cycle. These include each time the firm's balance sheet is updated and credit reserves are tested for compliance with lender's credit policies, and during the optimization subroutine, when the model is testing for the optimal investment ratio of machinery to real estate to maximize the decision maker's end-of-period wealth.

To illustrate the calculation of a voluntary asset liquidation, the following example is presented. During the initial balance sheet update, the restricted real estate credit reserve, (CRDRESR.L), is evaluated relative to the minimum required credit reserve for the real estate asset class, MINCR.L. If the CRDRESR.L is less than MINCR.L, then

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the program calculates VOLLIQMIN.L, the amount of real estate to sell to bring CRDRESR.L into compliance with the lenders minimum credit reserve requirement. Equation (5.19) calculates the dollar value of the land required to be liquidated:

$$(5.19)\quad VOLLIQMIN.L = \frac{(ABS(CRDRESR.L-MINCR.L))}{((1 + GAMMA1S)*(1-ROW.L)*(1-DEL.L))}$$

where

GAMMA1S = Investment ratio of machinery to total real estate
ROW.L = Liquidity premium for real estate
DEL.L = Maximum leverage ratio established by lender

During the calculation of VOLLIQMIN.L, the model assumes that the machinery associated with the acreage being considered for sale must also be sold in order to maintain the investment ratio between machinery and total crop acreage, GAMMA1.S. Calculation of the machinery to be sold requires a two-step procedure. Step 1 is to calculate VOLLIQI.I, the dollar value of the machinery inventory to be sold.

$$(5.20)\quad VOLLIQI.I = \frac{((ABS(CRDRESR.L-MINCR.L)) - VOLLIQMIN.L*(1-ROW.L)*(1-DEL.L))}{\left(1 + \frac{(1-ROW.L)*(1-DEL.L)}{ROW.L}\right)}$$

VOLLIQI.I then serves as an input into equation (5.21) to calculate VOLLIQMIN.LI, that portion of the machinery to be liquidated. It can be used to assist in balancing the real estate credit reserve expression.

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$$(5.21) \quad VOLLIQMIN.LI = \frac{(1 + DE.I * (\frac{1}{(1 - ROW.I)})^{DE.I})}{(1 - ROW.I)} * \frac{VOLLIQI.I}{(1 - ROW.I)}$$

where

$$DE.I = \frac{DBT.I}{EQTPOS.I}$$

EQTPOS.I = Intermediate asset equity position without contingent capital gain tax

DBT.I = Total intermediate debt including contingent capital gains taxes

After the liquidation of the machinery and real estate the firm's balance sheet equations are updated and the credit reserves are again checked for compliance with the lender's credit policy parameters.

Updating of the firm's real estate accounts is a complex task because the model liquidates each parcel separately. This procedure is required in order to calculate the respective capital gains (sale price - cost basis) for each parcel. Any capital gains tax is subsequently used in calculation of the firm's total taxes for the period in the tax subroutine in Module 5. Appendix Section B contains the complete details for the real estate sale and balance sheet update routines.

5.8.3 Forced Asset

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5.8.3 Forced Asset Liquidation

The decision maker faces the possibility of forced asset liquidation when the firm's net cash flow for the period is negative. The program will first check the firm's current asset restricted credit reserve, CRDRESR.C, to determine whether adequate funds are available to cover the deficit cash flow. If the CRDRESR.C is inadequate, the model then checks to see if the firm has refinanced its real estate loan within the past three years. If the real estate refinancing option has not been used within the past three years, and if the firm's real estate restricted credit reserve, CRDRESR.L, is adequate to balance both the deficit cash flow and loan closing costs associated with the refinancing, then the model will refinance the firm's real estate loan. The firm incurs the following loan costs with the refinancing option:

$$REFINCOST = (500 + .05 * ABS(NCF)) \quad (5.22)$$

where

ABS(NCF) = Absolute value of deficit cash flow

The 500 dollar fee represents the bank's loan processing charge for processing the loan application, searching the real estate title, and requisite document filing fees. The variable charge of 5 percent represents loan points charged by the lender for obtaining the new money.

In the case where the firm had refinanced its real estate debt within the last three years, and CRDRESR.C <

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ABS(NCF), then the firm would be forced to liquidate machinery and real estate assets to balance the deficit cash flow for the period. The program utilizies available CRDRESR.C, before liquidating any real estate or machinery. The adjusted cash flow deficit, ADJCFD, equals:

$$(5.23) \quad ADJCFD = (ABS(NCF) - CRDRESR.C)$$

Equation (5.24) is then used to calculate the forced machinery liquidation based on the current GAMMA1S ratio of machinery to real estate investment:

$$(5.24) \quad FORLIQ.I = \frac{(ADJCFD * GAMMA1S)}{(1 - ROW.I)} * \frac{.9000001 * DE.I * \left(\frac{1}{(1 - ROW.I)}\right)^{DE.I}}{(1 - ROW.I)}$$

where

$$DE.I = \frac{(DBT.I - CP.I)}{(EQTPOS.I + CP.I - DEPREC)}$$

DEPREC = Depreciation expense for the current year

EQTPOS.I = Cost basis equity position for intermediate assets

The firm's total intermediate debt is reduced based on the GAMMA1S ratio times the adjusted deficit cash flow and the cost of liquidating the machinery:

$$(5.25) \quad DBT.I = DBT.I -(FORLIQ.I -(ROW.I * FORLIQ.I) -(ADJCFD * GAMMA1S))$$

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The amount of real estate to be liquidated is calculated by an equation similiar to (5.24). All references to intermediate assets are replaced by real estate expressions, and the GAMMA1S expression is replaced by (1-GAMMA1S).

After calculation of the amount of machinery and real estate to be liquidated, the firm's balance sheet is updated and all credit reserves are verified for compliance with the lender's credit policy parameters.

5.8.4 Bankruptcy Subroutine

Each time that the firm is required to liquidate assets, either voluntary or by necessity, the computer program tests for the possibility of bankruptcy. For example, during the real estate credit reserve verification routine discussed in section 5.8.2 the firm is technically bankrupt if either of the following conditions occur:

(5.26) IF (1-ROW.WEO) * TASSETS.M = TDBT.M or IF PAR = P

where

TASSETS.M = Market value of owned assets

TDBT.M = Total liabilities including contingent capital gains tax owed to the IRS

ROW.WEO = Weighted Liquidity Premium

The first condition for bankruptcy is that if the market value of the firm's total assets, less all liquidation costs, is less than the value of the firm's total liabilities, then the firm is, technically, bankrupt. The model will not accommodate a negative equity position. The

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second condition for bankruptcy is that if the model has liquidated all of the parcels of owned real estate and the firm still cannot bring the restricted real estate credit reserve expression into compliance with the lender's required minimum credit reserve, then the firm is bankrupt. If the firm experiences bankruptcy, the firm's balance sheet accounts are all set equal to zero:

TASSET.C = 0	Total current assets
TASSET.I = 0	Total intermediate assets
TASSET.L = 0	Total real estate assets
TASSETS.M = 0	Total market value of assets
TDBT.C = 0	Total current liabilities
TDBT.I = 0	Total intermediate liabilities
TDBT.L = 0	Total real estate liabilities
TDBT.M = 0	Total debt including IRS taxes
TEQTPOS.M = 0	Total market value of equity

Under either bankruptcy scenario, the computer program provides the decision maker with a bankruptcy message and the program is terminated.

5.9 Business Risk Management Techniques

5.9.1 Managing Commodity Price Risk

Business risk is defined to be the risk inherent in the firm independent of the way the firm is financed (Gabriel). There are two major sources of business risk to an agricultural firm: commodity price uncertainity and production, or yield, uncertainty. Business risk affects the farm firm through variability in the firm's net operating income. With regard to price risk, the decision maker has the option to reduce exposure to commodity price variability through the use of forward contracting. Mathematically the firm's ex-

pected total crop

expressed as:

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where

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pected total crop revenue without forward contracting can be expressed as:

$$(5.27) \quad CR = (P_c+\varepsilon_c)*Q_{tc} + (P_s+\varepsilon_s)*Q_{ts}$$

where

CR = Total crop revenue

P_c = Stochastic price of corn

ε_c = Standard deviation of corn price

Q_{tc} = Total quantity of corn

P_s = Stochastic price of soybeans

ε_s = Standard deviation of soybean price

Q_{ts} = Total quantity of soybeans

Without the use of forward contracting the firm's total crop revenue is exposed to potential commodity price variability.

The decision maker has the option to reduce the firm's crop revenue exposure to the uncertainity of volatile harvest time commodity prices by electing to forward contract up to 50 percent of the expected production for each crop. With forward contracting, the decison maker is able to 'lock in' a price for the grain contracted equal to the expected seasonally adjusted price. The firm's expected crop revenue using forward contracting can be expressed as:

$$(5.28) \quad CR = (P_c+\varepsilon_c)*(Q_{tc}-Q_{cc}) + (P_c*Q_{cc}) + (P_s+\varepsilon_s)*(Q_{ts}-Q_{sc}) + (P_s*Q_{sc})$$

where

Q_{cc} = Quan

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Q_{cc} = Quantity of corn contractedμ ($0 < Q_{cc} < 50\%$)

Q_{sc} = Quantity of soybeans contractedμ ($0 < Q_{sc} < 50\%$)

The model provides the decision maker with two commodity marketing strategies to select from, including forward contracting and cash sale at harvest. The model will default to 100 percent cash sale of corn and soybeans at harvest if a marketing strategy is not selected.

The forward contract price available to the decision maker for both corn and soybeans is each crop's seasonally adjusted harvest month price. Refer to Chapter 6, section 6.3.2, for a detailed discussion of seasonally adjusted commodity prices.

The use of forward contracting is not without risk to the firm. In the event that the decision maker uses forward contracting and the farm's actual production of the contracted crop falls below the contract quantity, the firm will be required to purchase grain to fulfill the contract. In the event that grain production falls below the contracted quantity, grain must be purchased at the seasonally adjusted commodity price plus a transaction cost per bushel in order for the firm to comply with the terms of the contract. Transaction costs of .03 cents per bushel for both corn (CTCF = .03) and soybeans (STCF = .03) have been built into the model.

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5.9.2 Managing Production Risk

The second source of business risk for agricultural producers is yield, or production, uncertainty. Yield risk includes both biophysical environmental factors, which are exogenous to the firm, as well as through firm-induced factors. Biophysical factors are considered unavoidable hazards and include drought, freeze, hail, excess moisture, wind damage, insects, and crop diseases.

Firm-induced factors which can influence yield outcomes include the timing of critical field operations, the mix and quantity of production inputs such as seed, fertilizer and chemicals, and the quantity and quality of the farm equipment available for planting and harvesting. These factors are contolled by management and are generally considered as 'good farming practices.' The quantity and age of the firm's field equipment influences the timeliness and accuracy of the firm's operation. The impact that the firm's machinery component has on potential crop yields relative to the firm's tillable land is discussed in section 5.8 of this chapter.

Management of exogenous biophysical environmental production risk factors is incorporated in the model through the option to purchase All-Risk Crop Insurance. The All-Risk Insurance program options incorporated into this model are based on the theoretical concepts contained in the All-Risk Crop Insurance evaluation program 'ARCIE' developed by Griffin and Black. The decision maker can select from one of

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three guaranteed yield levels and one of three indemnity or insured price levels. The available guaranteed yield levels include 50, 65 and 75 percent of the farm's adjusted five year historical yield level for the crop. The decision maker may select indemnity price levels of 70, 85 or 100 percent of the seasonally adjusted expected commodity price. If All-Risk Crop insurance is purchased, the model requires that 100 percent of the crop be insured.

Once the historical yield data has been entered, the program will generate tables of financial and probability information similar to Table 5-5 for both corn and soybeans. The table is designed to assist in reaching a decision concerning the purchase of All-Risk Crop Insurance.

Table 5-5 Sa

OPTION No.	GUAR. YIELD	INDM PRIC
	ALL-R	
BREAK-EVEN YIELD TO		
1	60 Bu	1.8
2	60 Bu	2.
3	60 Bu	2.
4	78 Bu	1.
5	78 Bu	2.
6	78 Bu	2.
7	90 Bu	1
8	90 Bu	2
9	90 Bu	2
10	No Ins: Ca	
	ENTER	

Table 5-5 Sample All-Risk Crop Insurance Decision Analysis Report

ALL-RISK INSURANCE TABLE: CORN

BREAK-EVEN YIELD TO CONSIDER HARVEST WITH MAX INSUR. COV: 41 BU

OPTION No.	GUAR. YIELD	INDMN. PRICE	PREMIUM COST	ODDS OF PAYOFF	CASH FLOW EXPOSURE
1	60 Bu	1.87	4.18/acre	1 in 72	(62,912)
2	60 Bu	2.28	5.08/acre	1 in 72	(63,126)
3	60 Bu	2.68	5.98/acre	1 in 72	(63,341)
4	78 Bu	1.87	5.23/acre	1 in 11	(44,067)
5	78 Bu	2.28	6.35/acre	1 in 11	(44,375)
6	78 Bu	2.68	7.47/acre	1 in 11	(44,683)
7	90 Bu	1.87	10.76/acre	1 in 5	(33,527)
8	90 Bu	2.28	13.07/acre	1 in 5	(34,331)
9	90 Bu	2.68	15.37/acre	1 in 5	(35,136)
10	No Ins: Cashflow Exposure, 100% Crop Failure				(79,250)

ENTER YOUR INSURANCE SELECTION NUMBER (1-10) ?

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The 50, 65 and 75 percent guaranteed yield levels are computed based on a three-year historical mean yield for both corn and soybeans. The high and low yields are disregarded before calculating a three-year trimmed mean. A coefficient of variation of .25 is used as a computational shortcut in determining the standard deviation of the trimmed mean.[3] Calculation of the indemnity prices are based on the expected seasonally adjusted commodity prices.

The decision maker is provided with the following additional information to assist in evaluating a purchase of All-Risk Insurance:

1. Cash Flow Exposure: The model provides the user with a projected cash flow exposure position for the crop for each of the guaranteed yield and indemnity price selections (1-9). The insurance payoff is computed on a potential yield outcome of one bushel less than the guaranteed yield. The cashflow exposure for the corn crop is calculated as follows:

(5.29) CFEXPC = [EPC*(GYC-1) +IPC*1 -SUMCCVE -PREMC]*TOTACRN
-(SUMCFE*CAP/100) -(DBT.I*IN.I*CAP/100)
-(DBT.C*IN.C*CAP/100) -(DBT.L*IN.L*CAP/100)
-OPIN.C*TOTACRN

---

3. Coefficient of variation is calculated by dividing the standard deviation of the data series by the mean.

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CFEXPC = Cash Flow Exposure From the Corn Crop
GYC = Guaranteed Yield Level
EPC = Expected November Cash Corn Price
SUMCCVE = Total Variable Expenses Per Acre
PREMC = Insurance Premium Per Acre
TOTACRN = Total Acres of Corn
SUMCFE = Total Cash Fixed Expenses Less Interest
CAP = Percent of Total Acres Planted in Corn
DBT.C = Total Current Liabilities
DBT.I = Total Intermediate Liabilities
DBT.L = Total Long Term Liabilities
IN.C = Fixed Interest Rate Charged on DBT.C
IN.I = Fixed Interest Rate Charged on DBT.I
IN.L = Fixed Interest Rate Charged on DBT.L
OPIN.C = Operating Loan Interest on Variable Costs and All-Risk Insurance Premium

Referring to option 1 in Table 5-5, the 60 bushel guaranteed yield and 50 percent indemnity price selection, the firm would experience a (16,432) dollar cash flow shortfall from the corn crop at that level of insurance coverage. For option 9, the 90 bushel guaranteed yield and 100 percent indemnity price selection, the firm would experience a 46,946 dollar positive cash flow after all prorated cash expenses.

2. Odds of Payoff: The model provides the decision maker with the probability that the selected guaranteed yield level will result in a payoff. For example, the payoff odds are expressed in terms of 1 in 5, which implies a 20 percent chance of a payoff at the selected guaranteed yield level. The probability of payoff is calculated as follows:

$$(5.30) \quad PROBC = \frac{(GYC-LBC)^2}{(TMCC-LBC)*(UBC-LBC)}$$

where

TMCC = Three-Year Trimmed Mean
LBC = Lower Bound of the Triangular Distribution
UBC = Upper Bound of the Triangular Distribution

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3. **Break-Even Yield Required to Harvest:** This measure provides the decision maker with the minimum yield level necessary for a cost effective harvest; below this threshhold it is more cost effective to leave the crop in the field. This break-even point calculation takes into account the total prorated variable expenses the firm would have to incur in order to harvest the crop, divided by the expected seasonally adjusted crop price.

In summary, the All-Risk Crop Insurance option contained in this model is designed to provide the decision maker with a systematic approach to assessing the possible benefits and costs of managing production risk.

5.10 Family Consumption Activities

Family consumption patterns are important to the decision maker because cash withdrawals for family living directly reduce the firm's available cash flow, and as a result reduce the firm's liquidity and debt service capacity. Research regarding farm family consumption patterns by Brake and by Richardson and Dunn reveals that the basic form of the farm family's consumption function is a Cobb-Douglas type function. Brake's empirical study of farm household consumption indicates that the elasticity of current consumption out of after-tax income is approximately 0.59. Brake fit a Cobb-Douglas type function using after-tax income and family size as regressors (Pederson).

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Richardson developed a Cobb-Douglas type function using the 1973 USDA Family Farm Survey for the Midwest, while a more general function was developed by Dunn. Skees reports that both of these functional forms provide similiar patterns in consumption.

Skees uses the Dunn functional form because it provides the flexibility of adding a minimum acceptable level of consumption. Further, the Dunn functional form provides that the portion of consumption that is sensitive to income is added to the base or subsistence income level. Equation (5.31) presents the estimated Dunn function as:

$$(5.31) \quad \text{Consumption} = 10{,}000 + (61 * \text{ATAI})^{.5}$$

where

ATAI = After-Tax Accrual Income

Skees uses an exponentially smoothed average consumption function based on Dunn's equation, with a maximum income level of 130 percent of the average and a minimum income level established at 80 percent of the family's previous average consumption.

Further, Skees points out that developing an appropriate relationship between family expenditures and farm income is complicated still further by the possibility of income timing differences between cash basis and accrual income. The income timing issue is avoided in this model with the assumption that cash basis income equals accrual income; the model assumes that all crop inventories and

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Pederson adopts a household consumption function consistent with Brake's Cobb-Douglas function, which, like the Dunn and Skees equations, provides for a minimum or subsistence level of consumption for a family of four. The second component of Skees' equation involves a log-linear term using after-tax income.

The basic form of the family consumption function used in this model for the financial planning function is based on Brown's linear exponential smoothing technique. The rationale for this approach is that the values of the single smoothed actual family living withdrawal last period, $AFAMLIVING_{t-1}$, and the double-smoothed weighted average family living withdrawal, WGTAVFAML, lag behind the actual data whenever a trend exists. The difference between these two values can then be added to the single-smoothed value and adjusted for trend (Bails and Pepper). This formula is designed to maintain family consumption stability between years. The equation in the model for estimating family consumption for cash flow planning is:

$$(5.32)\quad EFAMLIVING_t = B*AFAMLIVING_{t-1} + (1-B)WGTAVFAML_{t-1}$$

where

$EFAMLIVING_t$ = Estimated Family Consumption in Period t

B = Consumption Weight Assigned to Period t-1 Actual Family Living Withdrawal

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$$WGTAVFAML_t = (WGTAVFAML_{t-1} + AFAMLIVING_{t-1})/2$$

After the model simulates the firm's cash flow for the year, the actual family expenditure ($AFAMLIVING_t$) is calculated using a consumption function form consistent with Dunn's equation. The equation in the model for actual consumption is:

$$(5.33) \quad AFAMLIVING_t = MININC + 61*(NIAT)^{.5}$$

where

$MININC_t$ = Minimum Family Income Withdrawal

$= (MININC_{t-1} + 1{,}000*EXEMP) * INFLA_t$

NIAT = Net Income After Tax

.5 = Elasticity of Family Consumption From Current After-Tax Income

The minimum and maximum income levels are adjusted annually for the number of family members claimed as dependents (EXEMP) and for the general rate of inflation (INFLA). Users of the model have the flexibility to change these parameters.

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5.11 Debt Optimization Methodology and Subroutine Structure

5.11.1 Introduction

The model's optimization subroutines, Modules 4 and 4A, incorporate the macro economic and firm-specific financial data with the output from the crop production subroutines, including enterprise budgeting, yield, all-risk insurance, and selection of the marketing strategies from Modules 1-3, to maximize the decision maker's end-of-period wealth position. The model utilizes the 'Monte Carlo' simulation technique to solve the firm's objective function for end-of-period expected utility based on the firm's apriori optimal debt position. The optimization subroutine consists of a series of integrated investment/disinvestment decision subroutines which are evaluated sequentially as follows:

- Calculation of the annual machinery investment required to maintain the firm's machinery inventory at last period's machinery-to-real estate investment ratio

- Calculation of the firm's initial expected utility based on the initial machinery-to-real estate investment ratio and last period's financial position

- Evaluation of cash leasing additional crop acreage

- Evaluation of purchasing additional tillable acreage

- Voluntary and possible forced liquidation of the firm's assets, either to maximize expected utility or to balance a deficit cash flow position

- Calculation of the firm's net cash flow and end-of-period wealth position

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The remainder of this section will discuss the methodology and key assumptions employed in the investment/disinvestment decision routines contained in the model's optimization subroutine.

5.11.2 Calculation of the Firm's Initial Expected Utility Value: EU(INI) Subroutine

The first subroutine within the optimal debt search routine involves calculation of the firm's initial expected utility, EU(INI). Calculation of EU(INI) is based on the firm's beginning-of-period resource endowment and the decision maker's crop production plans for the coming year. Figure 5-2 presents the logical flow for the steps involved in the calculation of the firm's EU(INI). The first step is transforming the firm's beginning-of-period balance sheet accounts into a search (hereafter referred to S-Balance Sheet) for use in the 'Monte Carlo' simulation and optimal debt search procedure. Transformation of the firm's asset and liability accounts into the search format facilites the tracking of data when the model calculates the hundreds of possible asset and debt combinations to be examined during the optimization process. The firm's beginning-of-period balance sheet accounts are maintained for reporting and analysis purposes.

Next, the model calculates the firm's initial GAMMA1 ratio, the ratio of the firm's farm machinery investment to the total market value of both owned and cash rented crop land. It is the key structual variable used in each of the

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investment/disinvestment subroutines as the incremental variable, faciliating the model's search for the firm's optimal debt position. The market value of rented acreage is estimated and included in the GAMMA1 ratio because in order for the firm to be able to plant rental acreage, the firm must maintain farm machinery with sufficient capacity to insure both the timely and cost efficient planting and harvesting of the firm's total tillable acreage. An obselete or undersized field machinery component will result in reduced yield potential, higher variable operating costs, and, ultimately, reduced profitability. The firm is required to own its machinery component because the model does not provide for financial leasing of farm machinery.

While the optimal debt search routine begins calculation of the firm's initial expected utility based on the initial GAMMA1 ratio, all subsequent iterations of the optimization routine involve incrementation of the GAMMA1 ratio. After calculation of the firm's initial GAMMA1 ratio, the model will proceed to calculate the firm's expected end-of-period wealth position for GAMMA1s ranging from a minimum ratio of .075 to a maximum of .45, in increments of .025. The minimum and maximum GAMMA1 were selected after reviewing the machinery-to-real estate investment relationships for cash crop farms participating in Michigan State University's

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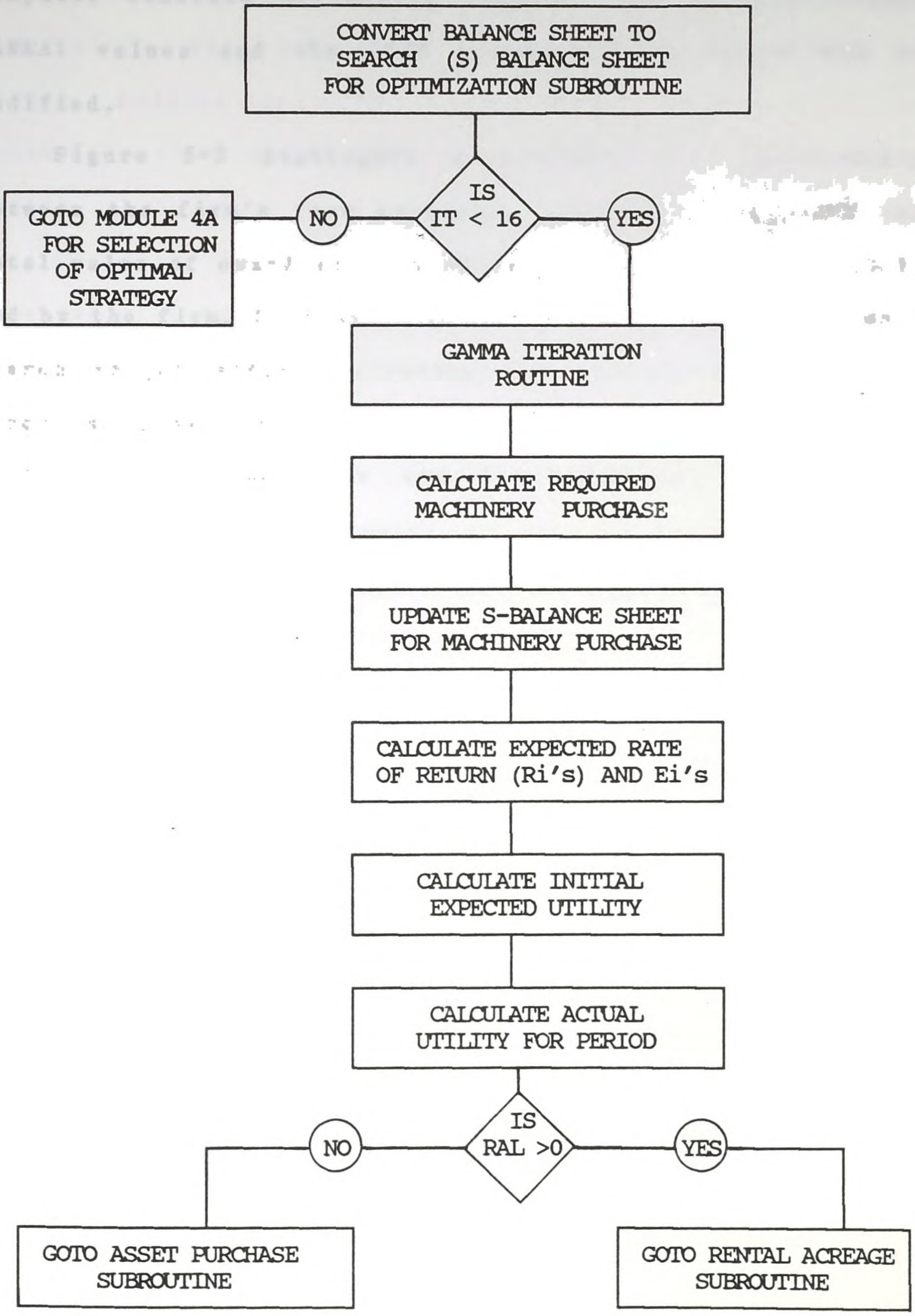

Figure 5-2 Initial Expected Utility Subroutine

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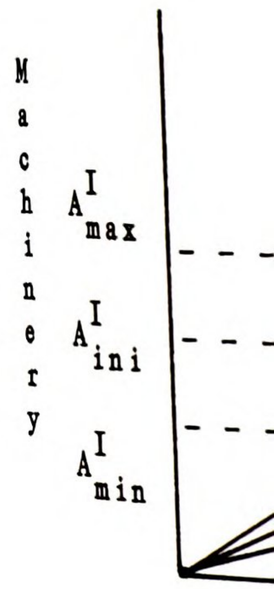

Figure 5-

computer Telefarm Accounting program. The minimum/maximum GAMMA1 values and the .025 incrementation factor may be modified.

Figure 5-3 highlights graphically the relationship between the firm's farm machinery investment, (A_I), and the total value of owned and rented real estate, (A_L), controlled by the firm. Further, Figure 5-3 illustrates the GAMMA1 search range: after evaluating the initial GAMMA1, γ_{ini}, proceeds to test all GAMMA1's between the minimum, and the maximum, in increments of .025. For simplicity, the acreage, and subsequently, total value, of real estate in Figure 5-3 is held fixed at A^L_{ini}. That result is, the firm not having

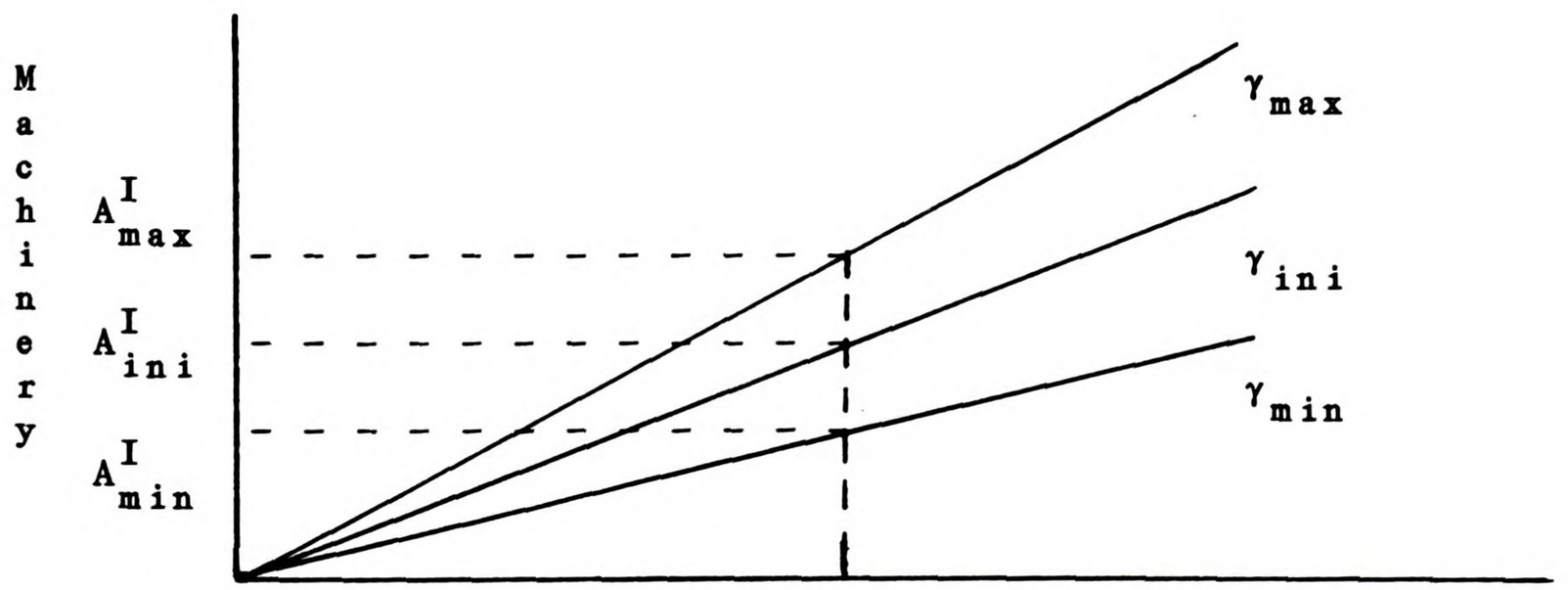

Figure 5-3 Mapping the Incrementation Range of GAMMA1: The Ratio of Machinery to Real Estate Investment, During Calculation of EU(INI)

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the opportunity to either rent or purchase additional acreage. In this simplified case, the incrementation of GAMMA1, holding real estate constant, searches for the optimal machinery investment to maximize end-of-period wealth.

The next step in the calculation of the firm's initial expected utility value is calculation of either the required machinery purchase or liquidation for the particular GAMMA1 ratio being evaluated. In the case of a required machinery purchase, the program will determine whether the firm has adequate cash available for the required down payment, and whether adequate machinery credit is available to finance the balance of the machinery purchase.

At each incrementation of GAMMA1 the program recalculates the machinery purchase or liquidation required for that GAMMA1, and reassesses the firm's available cash and machinery credit reserve to determine whether the transaction can continue. In the event of a shortage of either cash or available machinery credit, the program terminates the optimal debt search routine for that particular GAMMA1 ratio.

After determining the machinery component for the GAMMA1 increment being evaluated, the program proceeds to calculate the individual rates of return on total assets, R_is, and the individual e_is required to calculate EU(INI). Figure 5-4 presents the logic flow for the methodology used to calculate the firm's initial expected utility. The first

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step is calculation of the firm's bankruptcy point, E_0, the restricted credit reserve exhaustion point, E_1, and AC, a component of the EU(INI) expression. The bankruptcy point, E_0, is obtained with the following equation:

$$(5.34)\quad E0 = \frac{(ROW.WE0 + SIN.W) * STDBT.M}{STASSETS.M} - \frac{(1 - ROW.WE0) * STEQTPOS.M + WTHDRWLS}{STASSETS.M} - RBAR$$

where

ROW.WE0	=	Weighted Liquidity Premium
SIN.W	=	Weighted Interest Rate
STDBT.M	=	Total Liabilities of the Firm
STEQTPOS.M	=	Market Value Equity Position of the Firm
STASSETS.M	=	Market Value of Firm's Total Owned Assets
WTHDRWLS	=	Family Living and Non-Farm Cash Withdrawals
RBAR	=	Average Rate of Return on Total Assets

The calculation of the firm's restricted credit reserve exhaustion point, E_1, is obtained with the following expression:

$$(5.35)\quad E1 = \frac{E1NUM}{E1DEN} - RBAR$$

where

$$E1NUM = ROW.WE0 + SIN.W - (SIN.W * DEL.WE0) * (1 - ROW.WE0) * (SDBT.C + SLEAPAY.C + SDBT.I + SDBT.L) - (1 - ROW.WE0 - DEL.WE0 + ROW.WE0 * DEL.WE0) * STEQT + WTHDRWLS * (1-DEL.WE0) * (1-ROW.WE0)$$

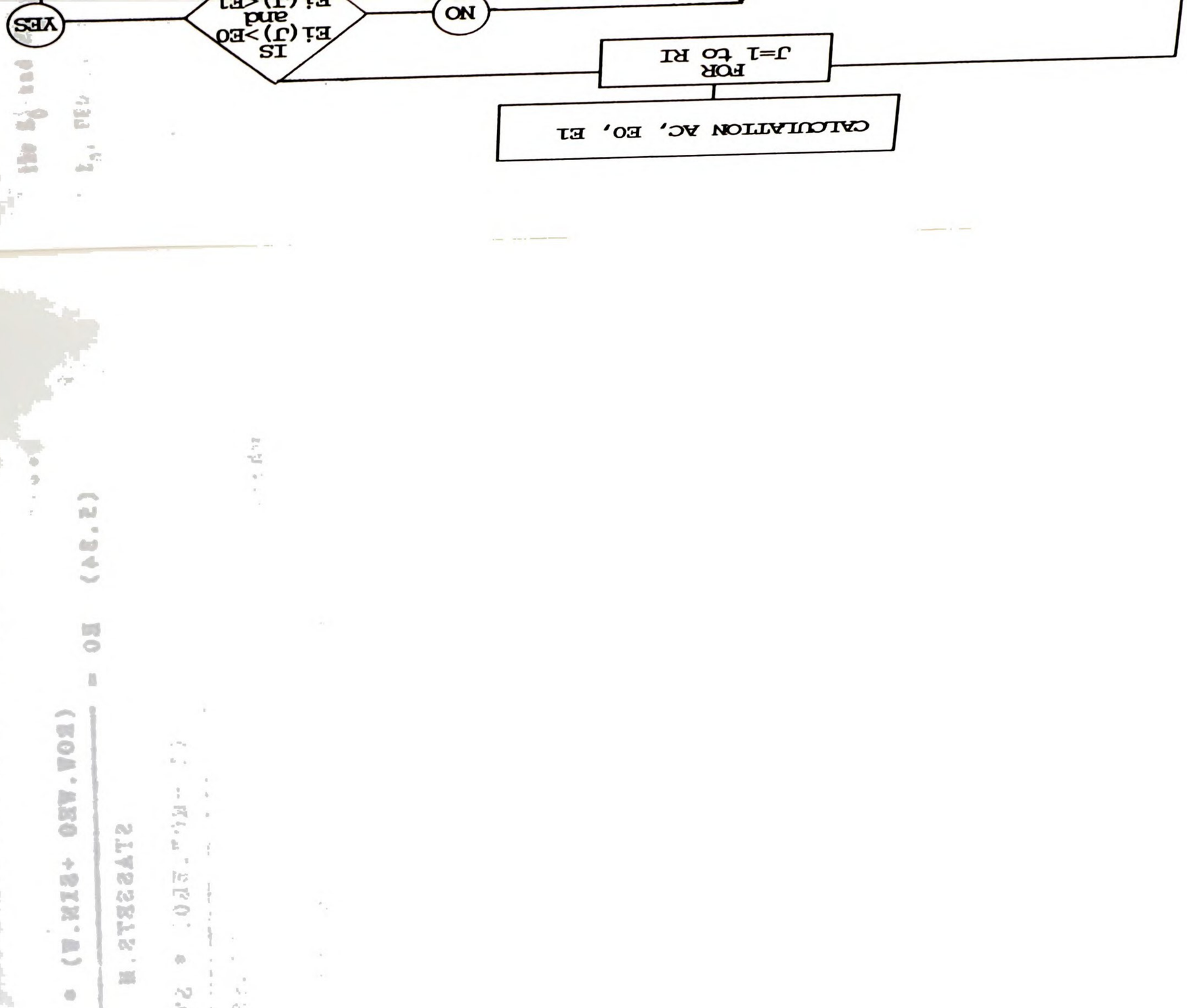
and

$$E1DEN = (1-DEL.WE0 * (1-ROW.WE0)) * STASSETS.M$$

where

SLEAPAY.C	=	Lease Payable on Rental Acreage
SDBT.C	=	Total Current Liabilities
SDBT.I	=	Total Intermediate Liabilities
SDBT.L	=	Total Long Term Liabilities

The AA, AB and AC expressions are components of the EU(INI)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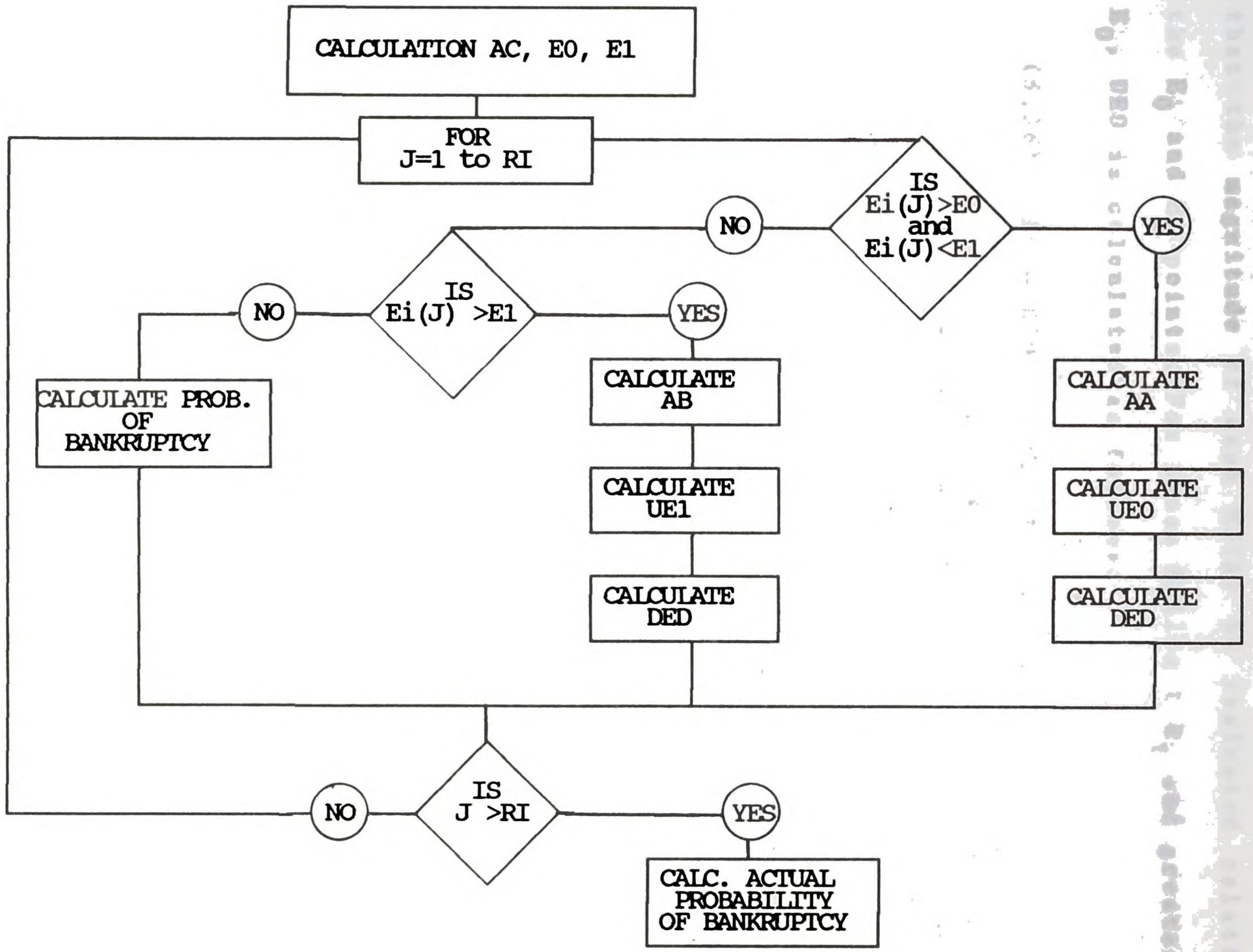

Figure 5-4 Methodology For Calculation of Initial Expected Utility

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expression which have not been presented here due to their length. The interested reader may review these expressions in Appendix II, Module 4.[4] Calculation of EU(INI) requires that the magnitude of each EI(J) be evaluated relative to the E_0 and E_1 points. For those EI(J)s $<$ E_1 and greater than E_0, UE0 is calculated as follows:

$$(5.36)\quad UE0 = UE0 + LAMDA * RBAR - SIN.W + \frac{(EI(J) - E1*ROW.WE0)}{(1-ROW.WE0)} - \frac{STASSETS.TA}{(1-ROW.WE0)*(ROW.WE0*AC)} * LN^{-(LAMDA*AA)}$$

and

$$DED = DED + (RBAR - SIN.W + \frac{(EI(J) - (E1 + ROW.WE0))}{(1 - ROW.WE0)}$$

LAMDA is an estimation of the decision maker's risk aversion coefficient. For those EI(J)s $>$ E_1, calculation of UE1 is required as follows:

$$(5.37)\quad UE1 = UE1 + LAMDA*(RBAR + EI(J) - SIN.W)*LN^{-(LAMDA*AB)}$$

and

$$DED = DED + (RBAR - SIN.W + EI(J))$$

Finally, for EI(J)s $<$ E_0, when J $<$ RIS, then the frequency of bankruptcy is incremented as follows:

$$(5.38)\quad PRBBRY = PRBBRY + 1$$

and when J = RIS then

$$PRBBRY = \frac{PRBBRY}{RIS}$$

---

4. Within Module 4, the AA expression is calculated on line 4570, AB on line 4650 and AC on line 4470.

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5. Appendix
4890 and UAB

where RIS is the total number of E_is used to calculate RBAR. The 's' prefix on variables used to calculate E0, E1, UE0, and UE1 represents transition or S-balance sheet values, as discussed earlier.

After the initial expected utility has been calculated, the program calculates the firm's actual utility for the period. Figure 5-5 presents the logic flow for calculation of actual utility. In a manner similiar to EU(INI), EU(ACTUAL) is calculated based on the magnitude of the individual $E_i(J)$s relative to the E_0 and E_1 points. The program calculates E1count for E_is greater than E_1 and E0count for those E_is greater than E_0 and less than E_1. Figure 5-5 summarizes the steps involved in generating E0count and E1count and the requiste UAA# and UAB# expressions. Finally, when J = RIS the logic flow proceeds to calculate P0, P1, and P2, which are components used to calculate EU(ACTUAL) as follows:

$$(5.39) \quad EU(ACTUAL) = P0*0 + P1*TUAA + P2*TUAB$$

where

$$TUAA = UAA + (-LN^{(-LAMDA * UAAE)})$$

$$TUAB = UAB + (-LN^{(-LAMDA * UABE)})$$

The UAAE and UABE expressions are components of EU(ACTUAL), which are not presented here due to their length.[5] After EU(ACTUAL) has been calculated the program proceeds to evaluate the opportunity to rent additional acreage.

---

5. Appendix B, Module 4 presents the UAAE expression on line 4890 and UABE on line 4920 for the interested reader.

SET EOcount
NO
P0 = [1-(EO
P1 = EOcount
P2 = E1count
NO
YES
CALCULATE TUA#

Figure 5-5

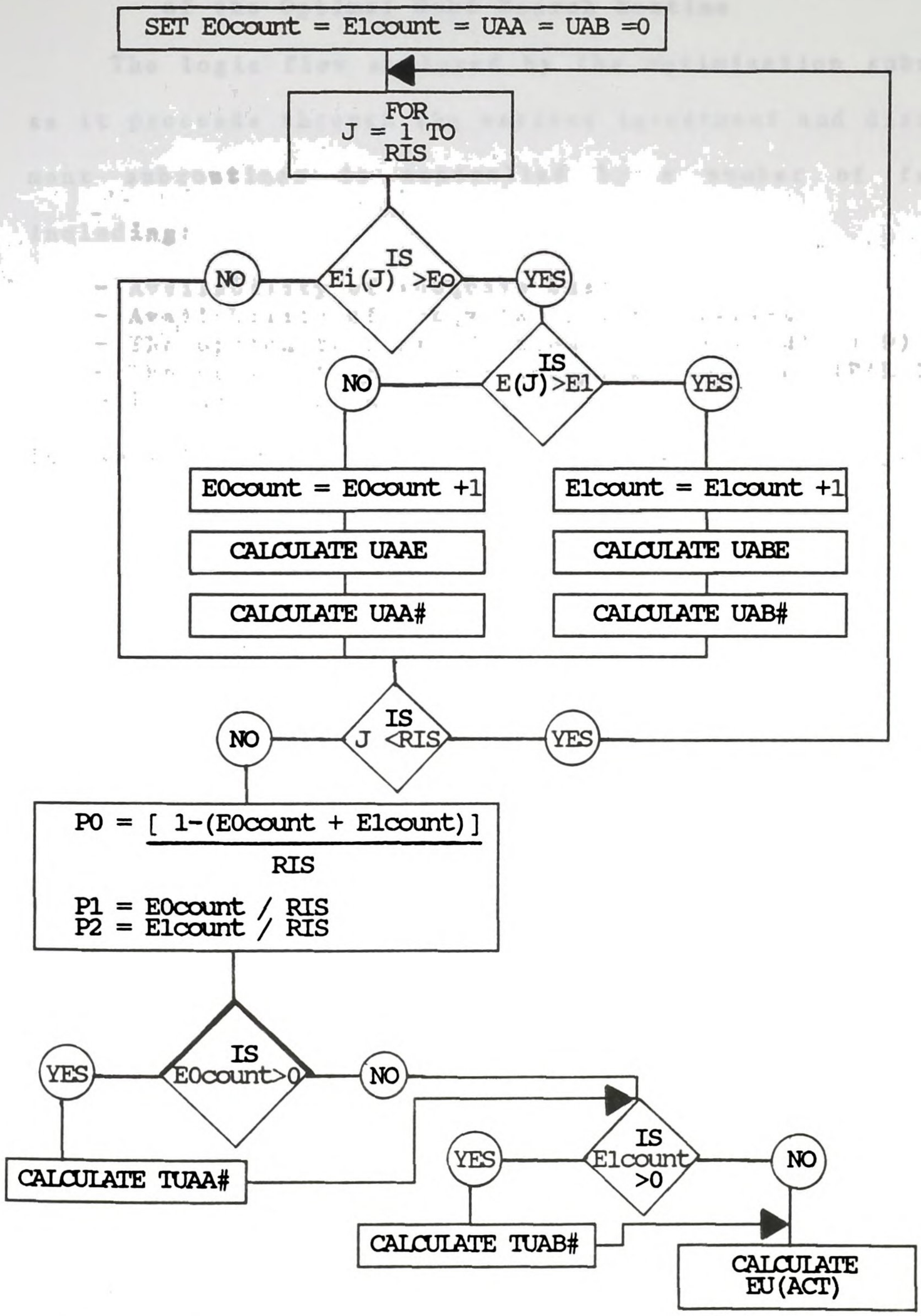

Figure 5-5 Methodology For Calculation of Actual Utility

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5.11.3 Testing Signs on Expected Utility Results for Termination of the Optimal Debt Search Routine

The logic flow employed by the optimization subroutine as it proceeds through the various investment and disinvestment subroutines is controlled by a number of factors, including:

- Availability of adequate cash
- Availability of adequate credit reserves
- The option to rent additional acreage (RAL > 0)
- The option to purchase additional acreage (PAL >0)
- The signs on the expected utility measurements

The search for the optimal debt position always begins with calculation of the firm's initial expected utility, EU(INI). Figure 5-6 summarizes all possible paths through the program's optimization subroutine, based on the sign obtained for the expected utility calculations for each of the investment/disinvestment subroutines. The extent of the optimal debt search process depends not only on the resultant signs of the expected utility expressions, but, more importantly, on the availability of cash and access to adequate credit to accommodate the rental and or purchase of additional acreage and the required machinery to farm the acreage.

To illustrate the logic flow of the optimal debt search process, consider the case in which the sign of the EU(INI) expression is negative and the firm does not have access to


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IS
EU(INI)<0
& EU(PUR)
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Figure 5-6

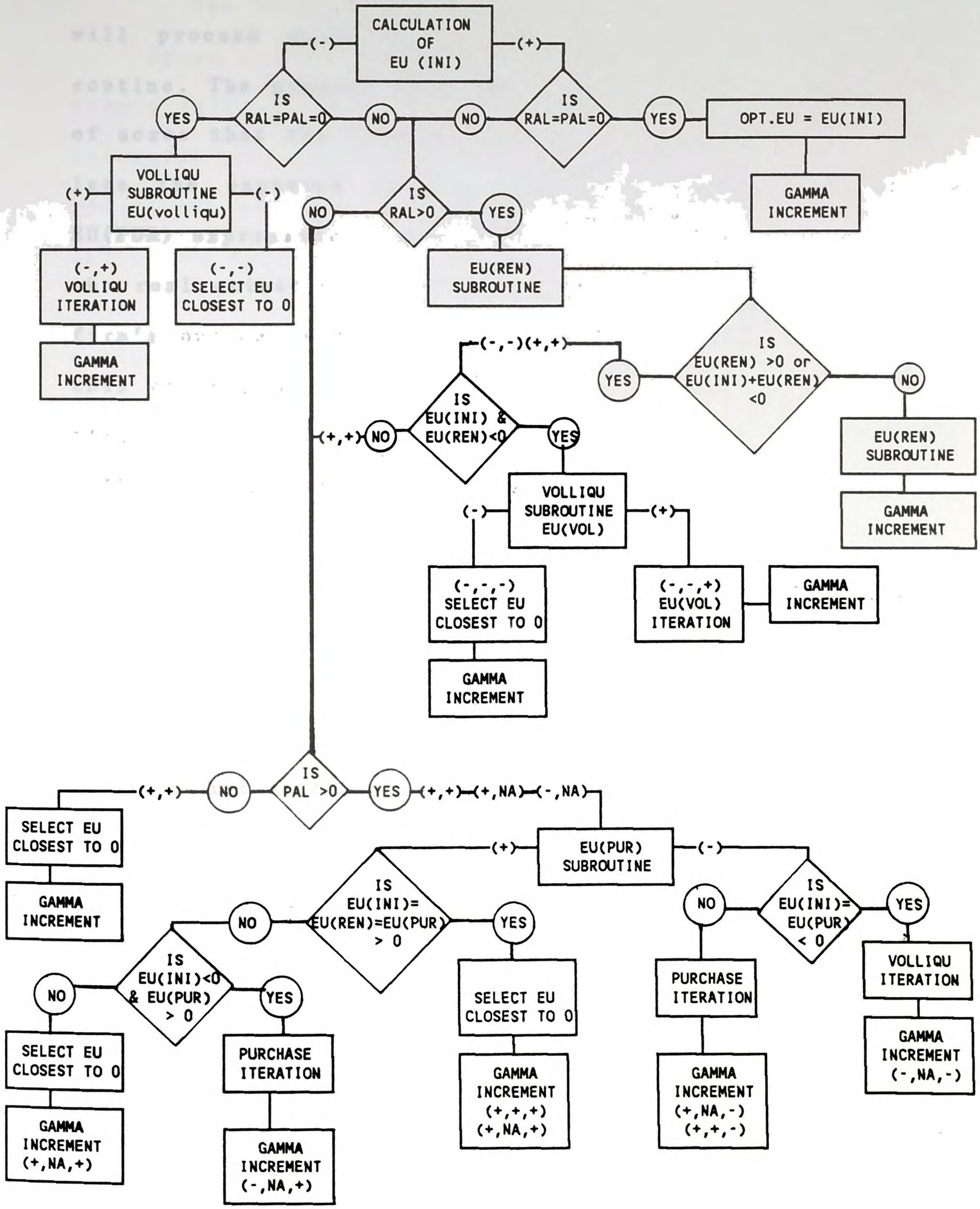
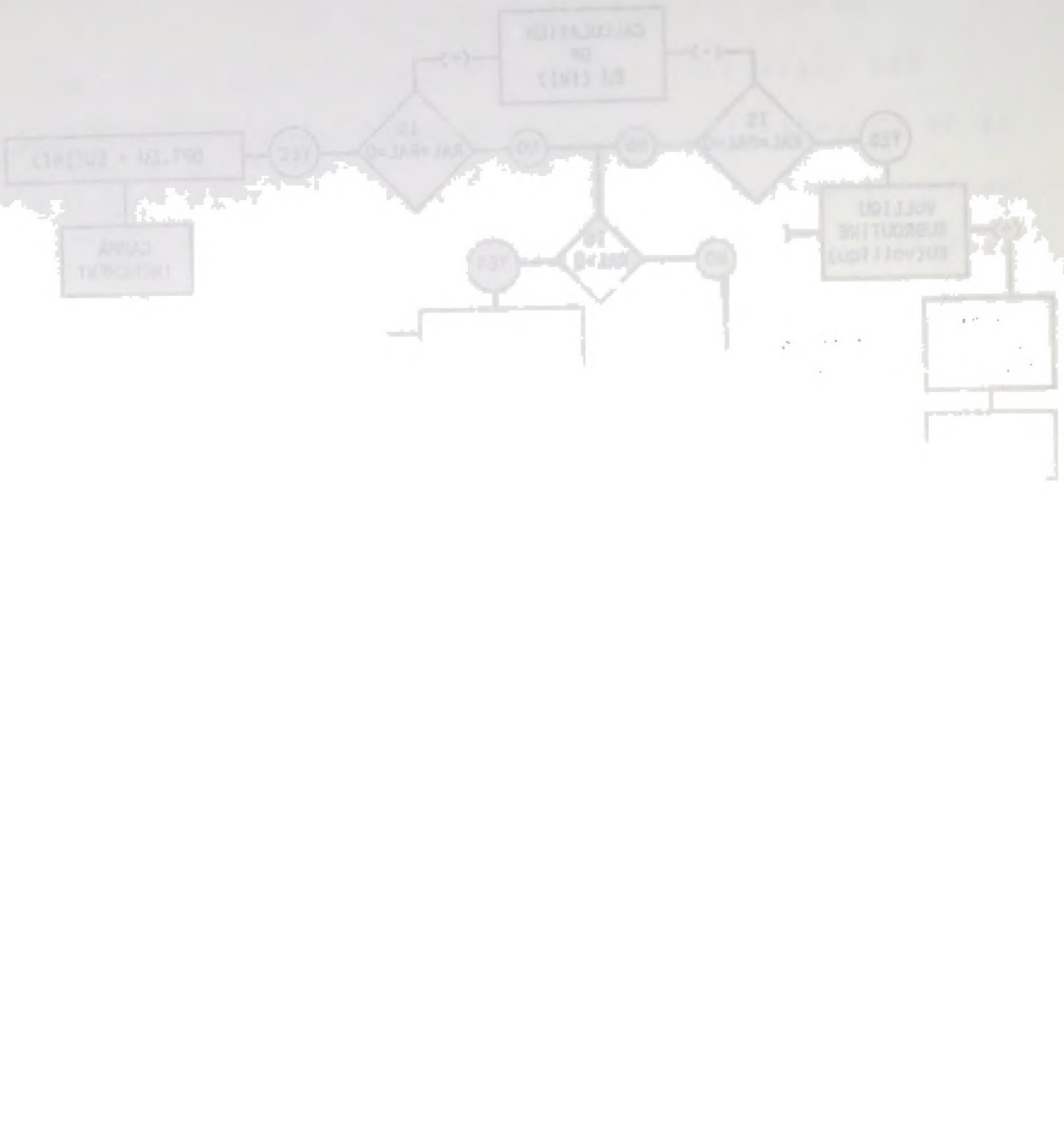


Figure 5-6 Testing Signs on Expected Utility Results For Termination of Optimization Search Routine



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additional rental acreage, RAL=0. In this case the program will proceed directly to the real estate purchase subroutine. The program will then determine the maximum number of acres that the firm is able to purchase, and then calculate the expected utility, EU(PUR). If the sign of the EU(PUR) expression is positive, the program will then go to the real estate purchase iteration routine. Given that the firm's optimal debt solution is realized when OPT.EU=0, in this example where EU(INI)= (-) and EU(PUR)= (+), the optimal debt solution is bounded by the intermediate expected utility results. The EU(PUR) iteration routine will solve for the number of acres to purchase so that OPT.EU=0.

If the sign of the EU(PUR) expression is negative, the program will then proceed to the voluntary asset liquidation subroutine, EU(VOL). The EU(VOL) subroutine will liquidate a predetermined percentage of the firm's total assets in order to test whether the sign on the EU(VOL) expression will turn positive. If the sign on EU(VOL) is positive, the program will then proceed to the EU(VOL) iteration routine to determine the dollar value of assets that must be liquidated so that OPT.EU=0.

The methodology and key assumptions contained in each of the investment/disinvestment subroutines is discussed in more detail in the remainder of this section.

5.11.4 Evaluat
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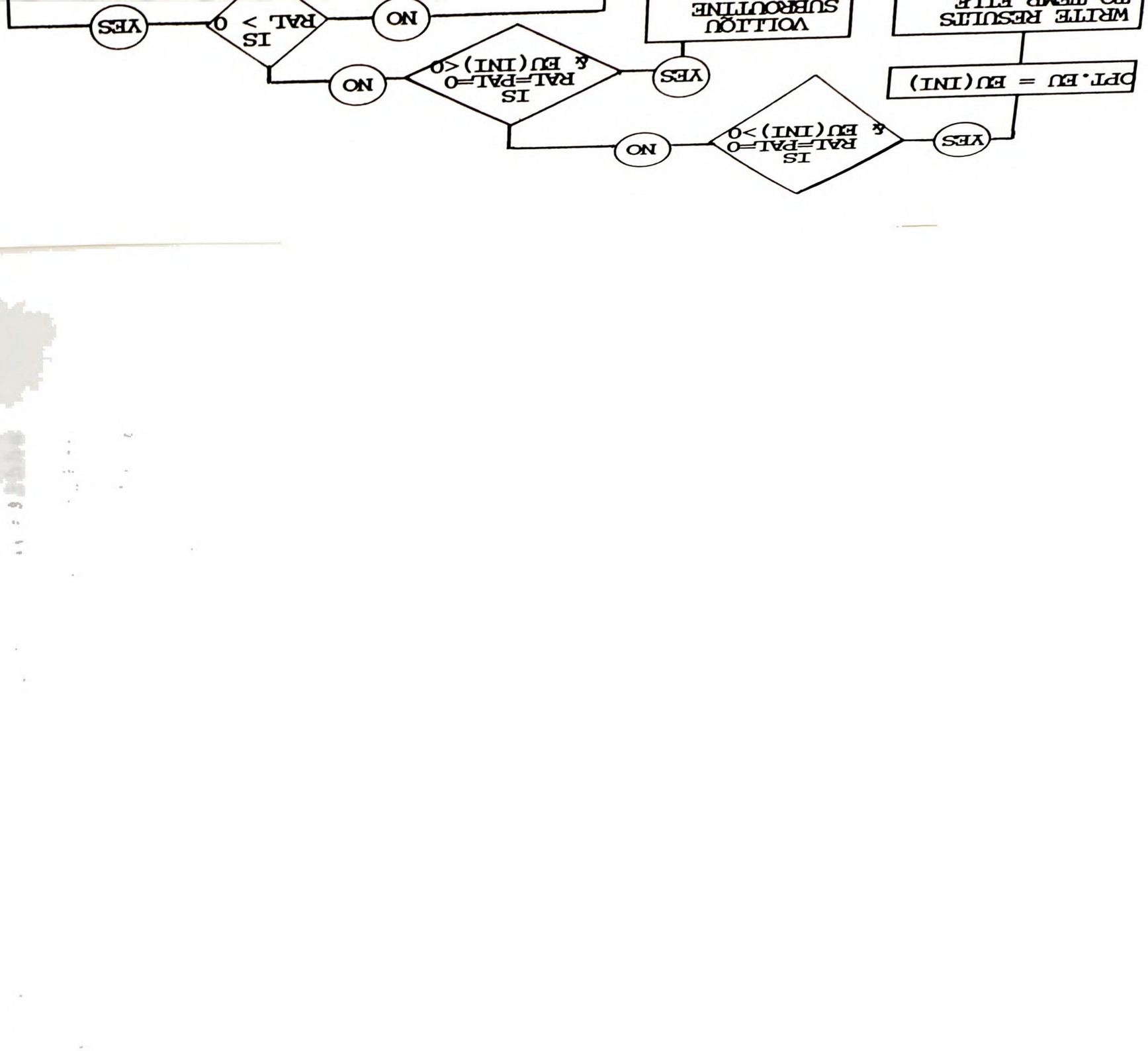
5.11.4 Evaluation of Renting Additional Acreage: The EU(REN) Subroutine

After calculating EU(INI) and EU(ACTUAL) based on the firm's initial resource endowments, the program proceeds to determine whether there is an opportunity to cash rent additional acreage. If additional rental acreage does not exist, or RAL=0, the program's logic flow proceeds to the real estate purchase subroutine. Figure 5-7 presents the methodology involved in evaluating the opportunity for, and calculation of, the expected utility EU(REN) the firm would realize by renting additional acreage. Having determined that RAL >0, the first step is to calculate the maximum number of additional acres that the firm is able to rent given available cash and credit reserves.

In order to rent additional acreage, the firm must have the necessary cash for both the required machinery down payment and 50 percent of the annual rent payment. The model requires that 50 percent of the annual rent payment be paid on January 1st, the day that the decision to rent the acreage is made, with the balance due and payable on December 31st. The firm must pay the January 1st payment with cash, while the balance of the rental payment is entered on the firm's balance sheet as a current liability-lease payable. The real estate lease is accounted for on the balance


WRITE RESULTS
TO TEMP FILE
OPT.EU = EU(INI)
IS
RAL=PAL=0
& EU(INI)>0
YES
NO
VOLLIQU
SUBROUTINE
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RAL=PAL=0
& EU(INI)<0
YES
NO
IS
RAL > 0
YES
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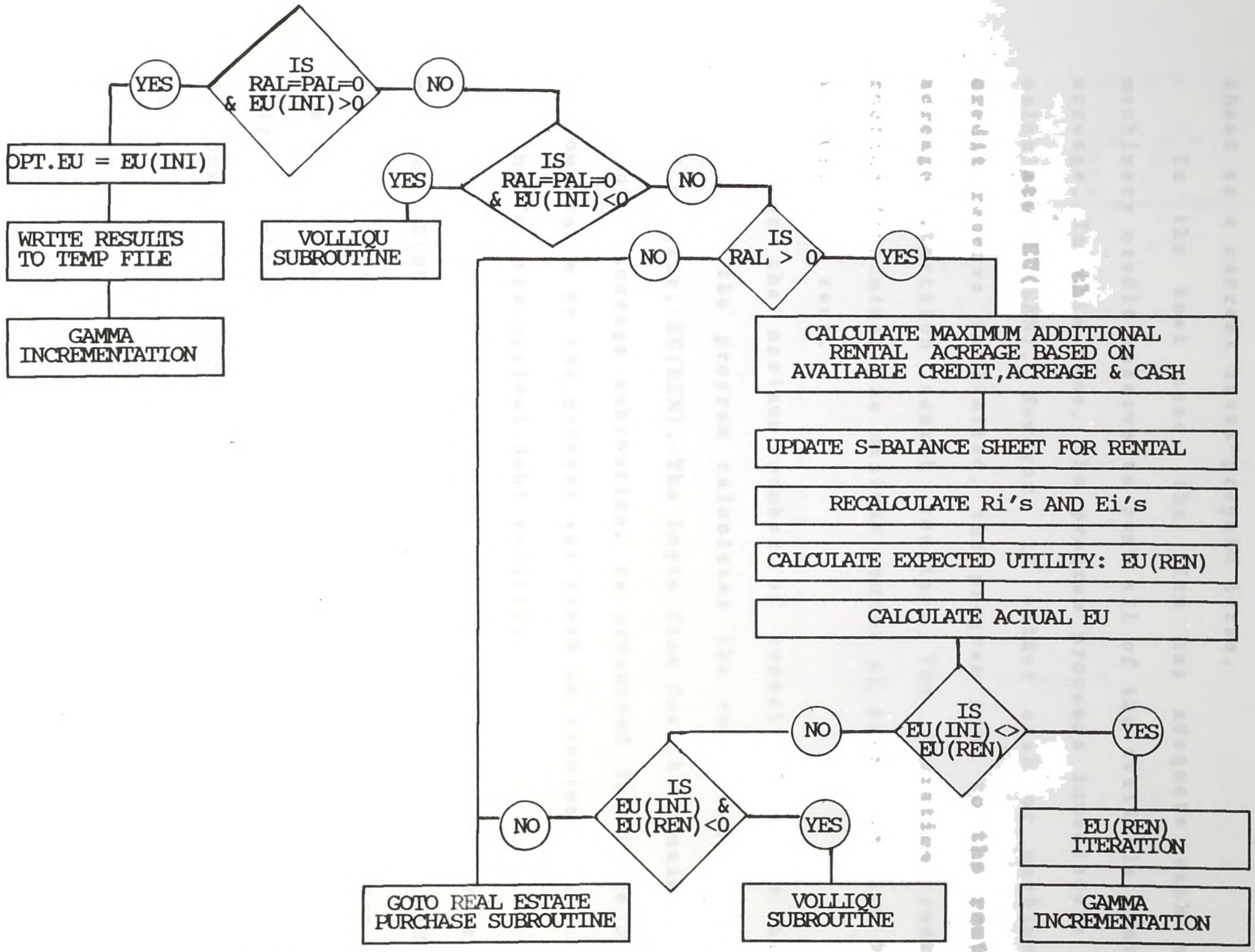

Figure 5-7 Rental Acreage Evaluation Subroutine

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In the best case, the firm has adequate cash and machinery credit reserve to rent all of the available rental acreage. In this case, the program proceeds immediately to calculate EU(REN). However, if either cash or machinery credit reserve is limited, the program goes to the rental acreage iteration search routine. The iteration search routine determines the maximum number of acres the firm has resources to rent.

After the maximum number of rental acres has been determined, the program calculates the rental acreage expected utility, EU(REN). The logic flow for the remainder of the rental acreage subroutine, as presented in Figure 5-7, is comparable to the process set forth in section 5.11.3 for solving for the optimal debt position.

Figure 5-8 highlights the rental acreage search routine and the EU(REN) iteration process along the initial GAMMA1 ray. The initial resource points, A^{I}_{ini} and A^{L}_{ini}, represent the total value of machinery and real estate, respectively, which resulted in EU(INI). Assigning a market value to the maximum rental acreage the firm is able to lease and adding to it the total market value of the firm's initial real estate holdings yields an amount represented by point A^{L}_{R*}. Based on A^{L}_{R*} and the initial GAMMA1 ratio, the required machinery component is A^{I}_{R*}. For purposes of this example, assume that the sign of EU(INI)= (-) and EU(REN)= (+).

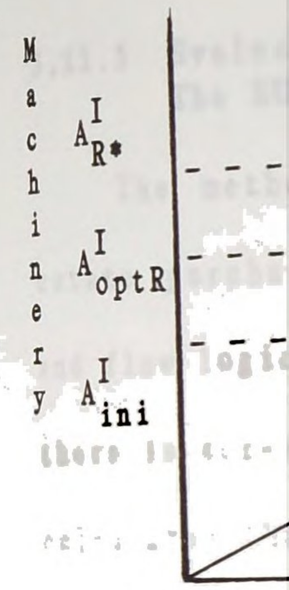

Figure 5-8

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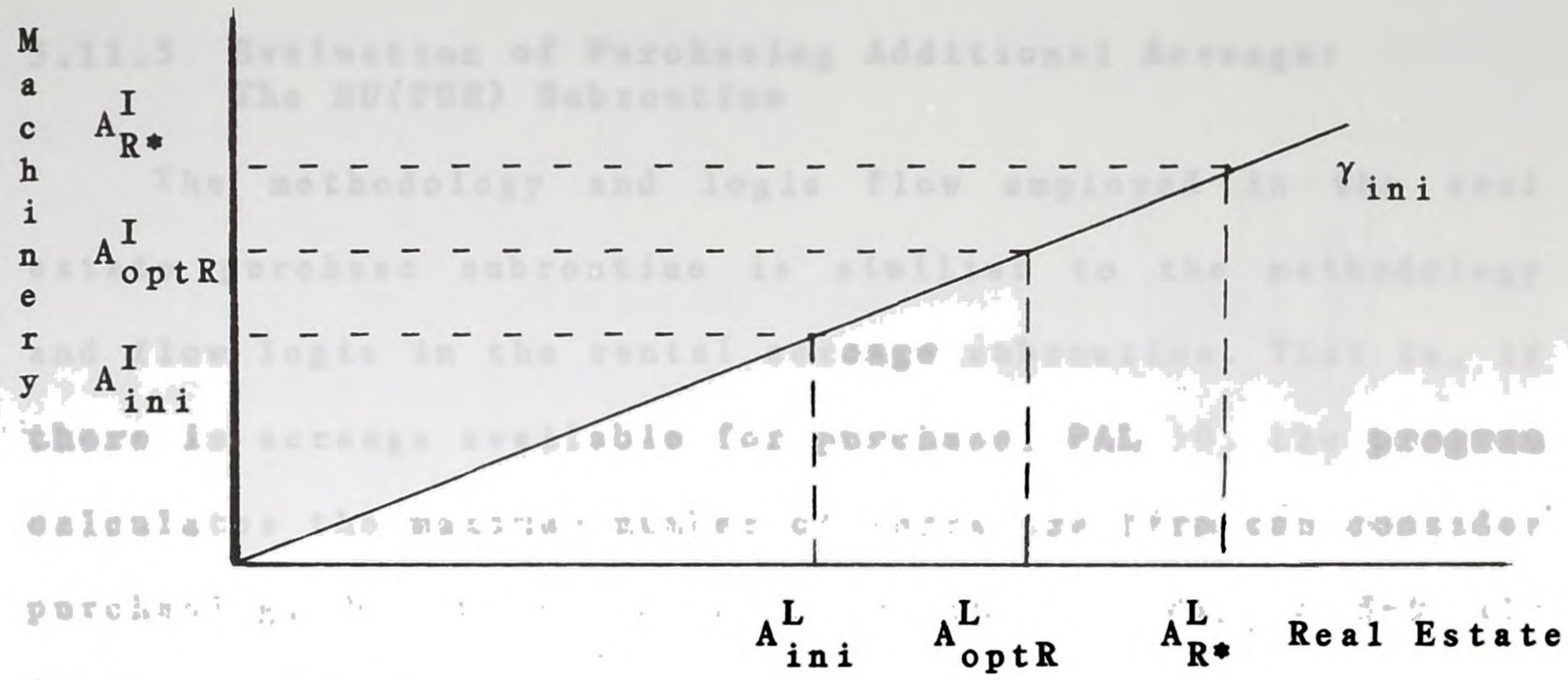

Figure 5-8 Mapping The Rental Acreage Optimal Debt Search Process For The Initial Machinery/Real Estate GAMMA1 Ratio

This situation would result in the logic flow proceeding to the EU(REN) iteration routine to identify the number of additional rental acres such that OPT.EU=0. The optimal debt solution that cooresponds to OPT.EU=0 is presented graphically by the points A^L_{opt} and A^I_{opt} for the total value of real estate and machinery respectively.

The rental acreage search process and calculation of EU(REN) is repeated for each GAMMA1 ratio between the minimum and maximum value for which the firm has available resources. As with calculation of EU(INI), if the firm experiences one or more limiting resources, the logic flow will terminate any further rental acreage search for that GAMMA1 ratio. When the rental acreage search routine is complete the program proceeds to the real estate purchase subroutine.

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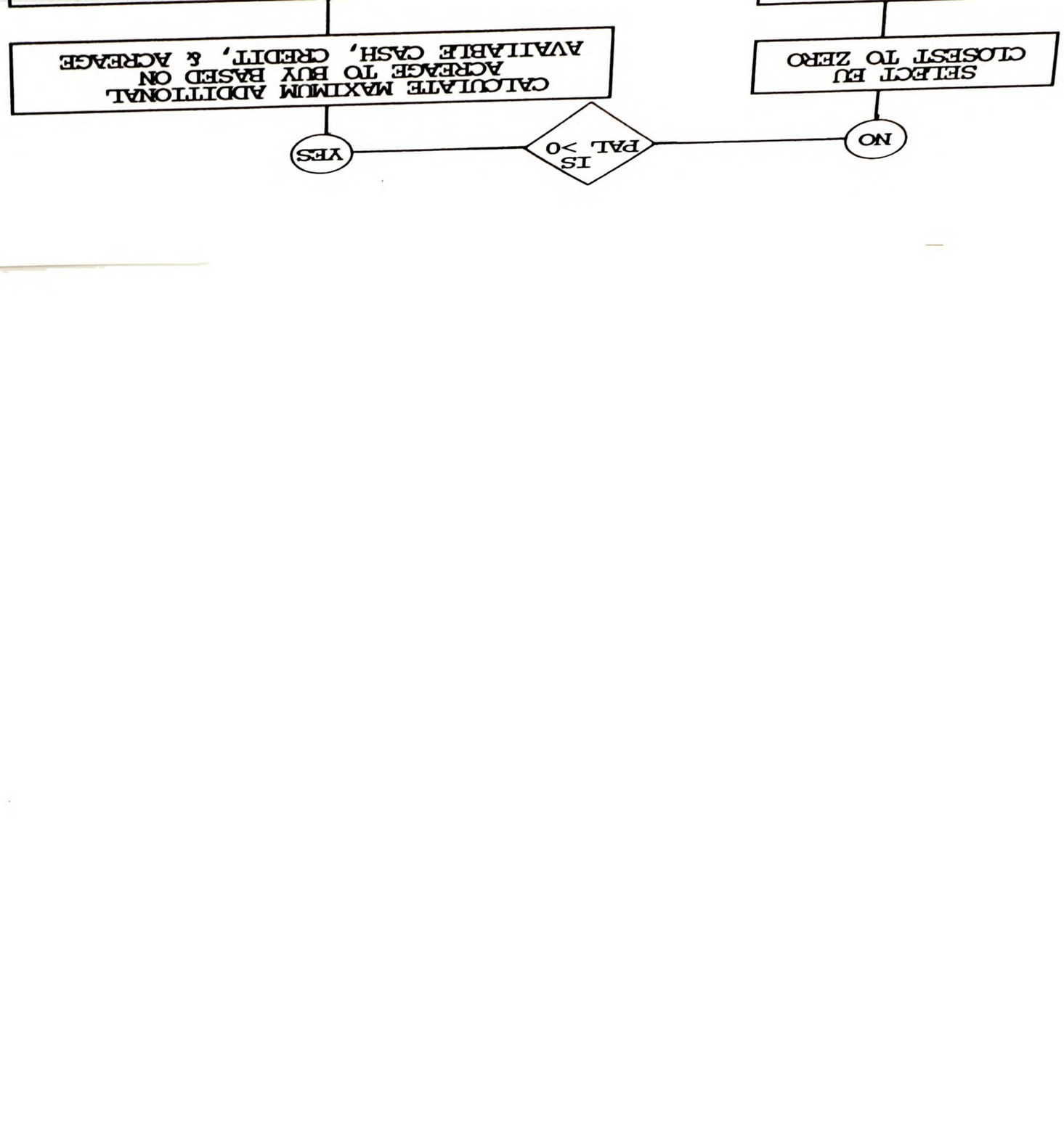
5.11.5 Evaluation of Purchasing Additional Acreage: The EU(PUR) Subroutine

The methodology and logic flow employed in the real estate purchase subroutine is similiar to the methodology and flow logic in the rental acreage subroutine. That is, if there is acreage available for purchase, PAL >0, the program calculates the maximum number of acres the firm can consider purchasing, based on available resources. Figure 5-9 illustrates the real estate purchase subroutine.

After calculation of EU(PUR), depending on the sign of the EU(PUR) expression, there are several alternative paths that the logic flow can take. For example, if EU(INI) >0 and EU(REN) >0, or EU(INI) >0 and RAL=0, and EU(PUR) <0, then the logic flow proceeds to the real estate purchase iteration routine to identify the number of additional acres to purchase to solve for OPT.EU= 0.

If EU(INI), EU(REN) and EU(PUR) are all greater than zero, then the program will select the EU value closest to zero as the optimal debt position. Alternatively, if EU(INI) <0, RAL=0 and EU(PUR) <0 the logic flow proceeds to the voluntary asset liquidation subroutine to determine the sign on the EU(VOL) expression. If EU(VOL) >0, the program proceeds to the voluntary asset liquidation iteration


CALCULATE MAXIMUM ADDITIONAL
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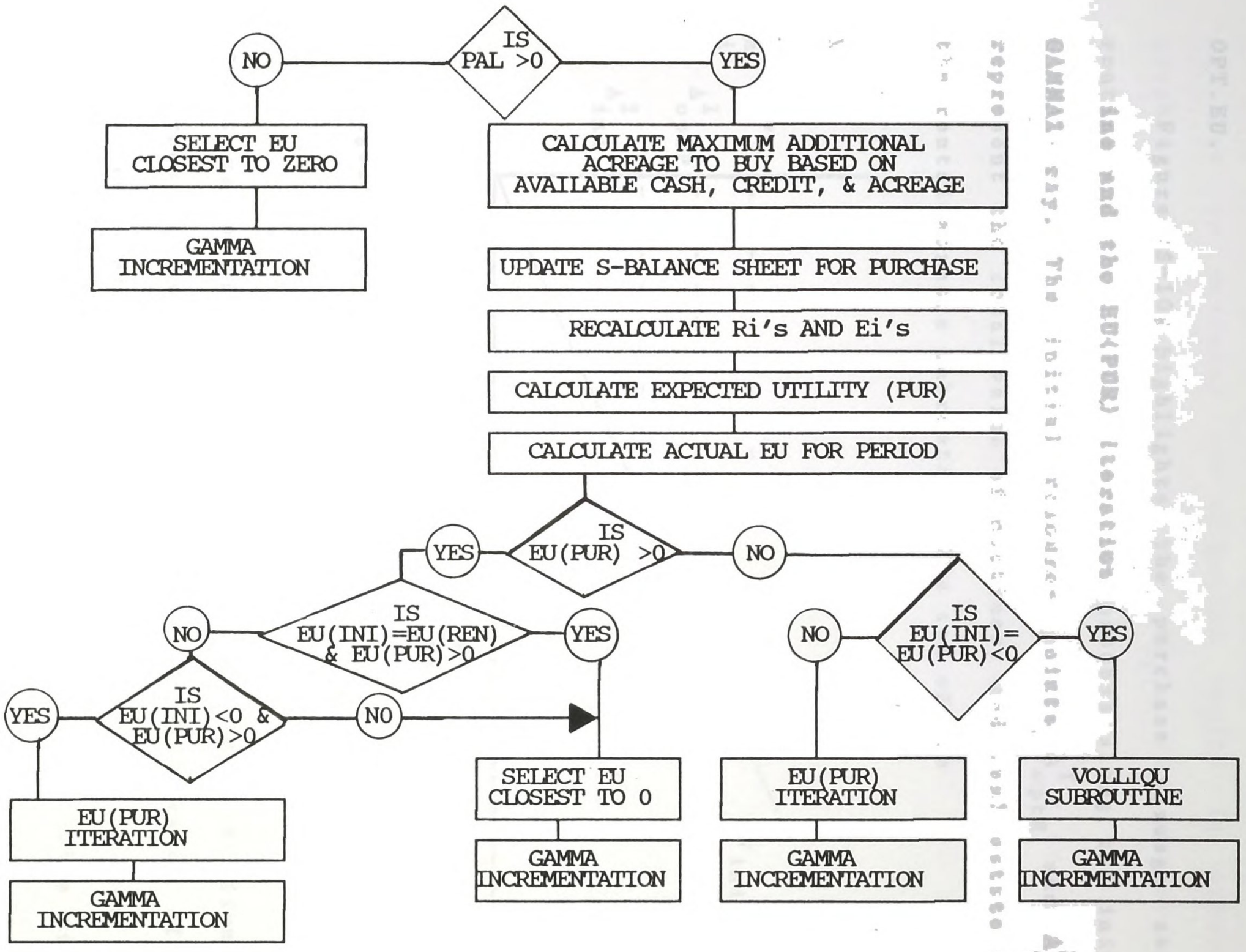

Figure 5-9 Real Estate Purchase Subroutine

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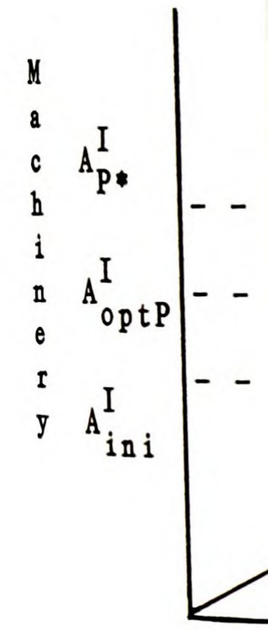

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Figure 5-10

routine to solve for OPT.EU=0. If EU(VOL) <0 the program will select the EU value closest to zero and set it equal to OPT.EU.

Figure 5-10 highlights the purchase acreage search routine and the EU(PUR) iteration process along the initial GAMMA1 ray. The initial resource points A^{I}_{optR} and A^{L}_{optR} represent the total value of machinery and real estate from the rental acreage subroutine. The sum of the

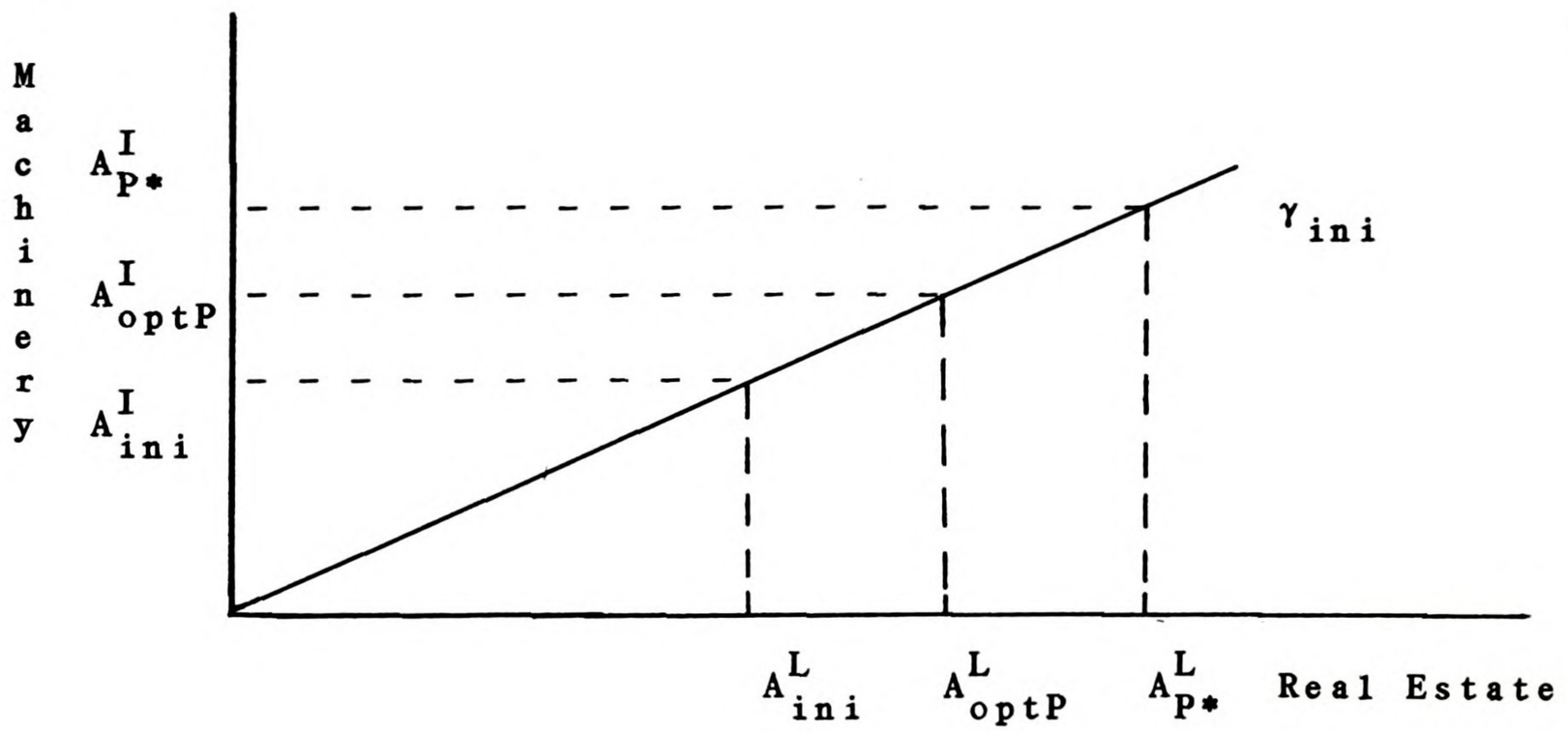

Figure 5-10 Mapping The Purchase Acreage Optimal Debt Search Process For The Initial Machinery-to-Real Estate GAMMA1 Ratio

market value of the maximum number of acres the firm has resources to purchase, added to the market value of the firm's real estate coming from the rental acreage subroutine, when RAL >0, or the sum of the market value of the purchase acreage and the market value of the firm's initial real estate resource base, is represented by point A^{L}_{P*} in Figure 5-10. Based on A^{L}_{P*} and the initial GAMMA1 ratio

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GAMMA1 ratio.

the corresponding required machinery component is A^{I}_{P*}.

The identification of the optimal number of acres to purchase to maximize end-of-period wealth is presented graphically in Figure 5-10 as point A^{L}_{optP}, with the required machinery component labeled as A^{I}_{optP}.

Having solved the real estate purchase subroutine for OPT.EU=0, the program proceeds to the GAMMA1 incrementation routine to begin the calculation of EU(INI) for the new GAMMA1 ratio.

5.11.6 Evalua
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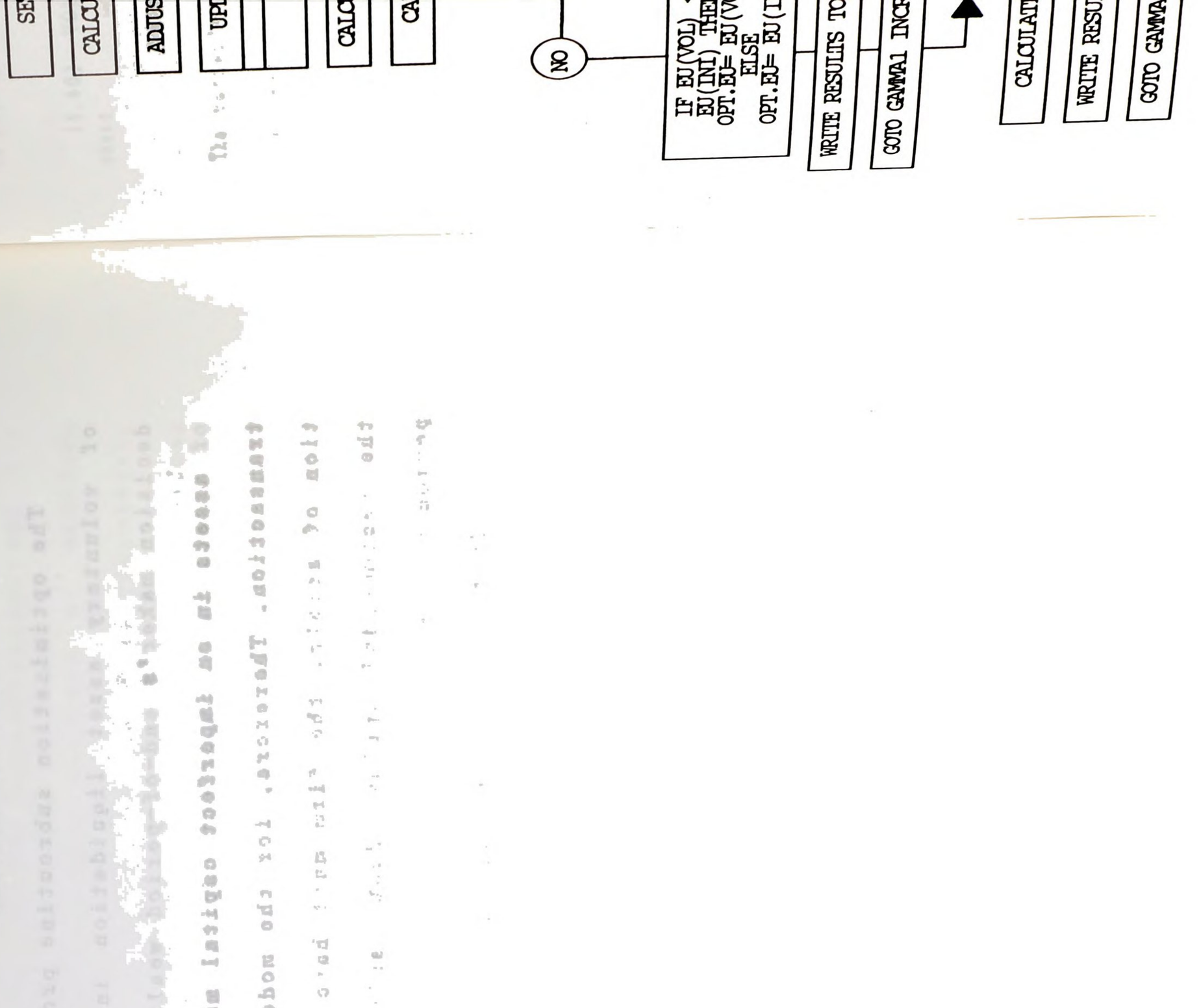
5.11.6 Evaluation of Voluntary Asset Liquidation: The EU(VOL) Subroutine

The optimization subroutine provides for the evaluation of voluntary asset liquidation in order to maximize the decision maker's end-of-period wealth position. Liquidation of assets in an imperfect capital market is not a cost free transaction. Therefore, for the model to recommend liquidation of assets, the firm must have significantly more than the recommended optimal debt capital to maximize end-of-period wealth.

Voluntary asset liquidation involves the liquidation of owned real estate, leased real estate and the respective machinery component in proportion to the GAMMA1 ratio being analyzed. The firm will incur transaction costs equal to the value of the asset being liquidated times the respective liquidity premium, ρ. In the case of rental acreage, the firm forfeits the prepaid lease payment, which is equal to 50 percent of the annual rental payment per acre times the number of acres being released.

Figure 5-11 summarizes the logic flow for the voluntary asset liquidation subroutine. As with the rental and real estate purchase subroutines, the liquidation routine first calculates the maximum quantity of assets to liquidate. The maximum asset liquidation percentage, PVOLLIQU.T, has been set at 20 percent for this study; however, the PVOLLIQU.T percentage can be adjusted if desired.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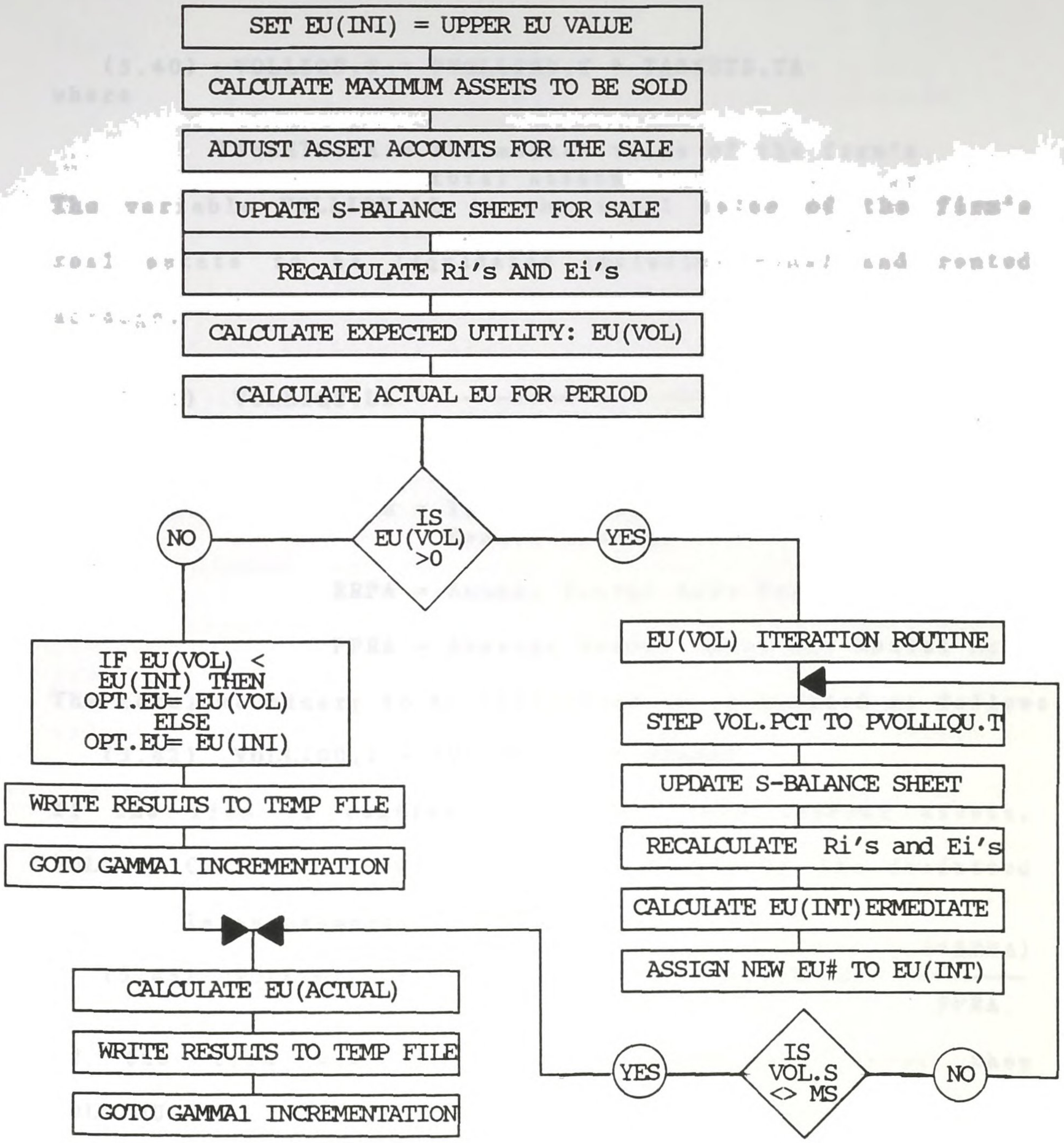

Figure 5-11 Voluntary Asset Liquidation Subroutine

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The total value of assets to be liquidated, VOLLIQU.T, is calculated as follows:

$$(5.40)\quad VOLLIQU.T = PVOLLIQU.T * TASSETS.TA$$

where

TASSETS.TA = The market value of the firm's total assets

The variable VOLLIQU.LI is the total value of the firm's real estate to be liquidated including owned and rented acreage.

$$(5.41)\quad VOLLIQU.LI = \frac{VOLLIQU.T}{(\ 1 + GAMMA1 + PVOLLIQU.LR * (.5 * RRPA) * PPRA)}$$

where

PVOLLIQU.LR = Terminate the Lease on X Percentage of Rental Acreage

RRPA = Annual Rental Rate Per Acre

PPRA = Average Market Value Per Rental Acre

The total machinery to be liquidated is calculated as follows:

$$(5.42)\quad VOLLIQU.I = VOLLIQU.LI * GAMMA1$$

If the firm is renting crop land, then current assets, VOLLIQU.C, are reduced by the the amount of the forfeited prepaid lease payment:

$$(5.43)\quad VOLLIQU.C = VOLLIQU.LI * PVOLLIQU.LR * \frac{(.5*RRPA)}{PPRA}$$

If the firm did not lease acreage last year then VOLLIQU.C=0, and all real estate to be liquidated, VOLLIQU.LI, is owned real estate, VOLLIQ.LO = VOLLIQU.LI. Otherwise, owned real estate to be liquidated is calculated as:

$$(5.44)\quad VOLLIQU.LO = PVOLLIQU.LO * VOLLIQU.LI$$

and

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(5.45) VOLLIQU.LR = PVOLLIQU.LR * VOLLIQU.LI

where

PVOLLIQU.LO = The Ratio of Owned Real Estate to Total Real Estate Liquidated

PVOLLIQU.LR = The Ratio of Rental Real Estate to Total Real Estate Liquidated

The ratio of owned real estate to total real estate to be liquidated, VOLLIQU.LO, is set at 50 percent. Therefore, in the event of voluntary asset liquidation, rental and owned acreage will be liquidated based on a 50:50 mix.

Figure 5-12 highlights the voluntary asset liquidation search routine and the EU(VOL) iteration process along the initial GAMMA1 ray. The initial resource points, A^{I}_{ini} and A^{L}_{ini}, represent the total value of machinery and real estate from the initial expected utility subroutine. The maximum value of machinery, rental acreage and owned real estate to liquidate based on PVOLLIQU.T= .20, is represented by points A^{I}_{V*} and A^{L}_{V*} respectively. For this example, assume that the sign on EU(INI) is negative, and the opportunity to rent and purchase additional acreage did not exist, RAL and PAL =0. After calculation of the maximum assets to be liquidated, the subroutine logic flow will calculate EU(VOL). Assuming that the sign on EU(VOL) is positive, the program will

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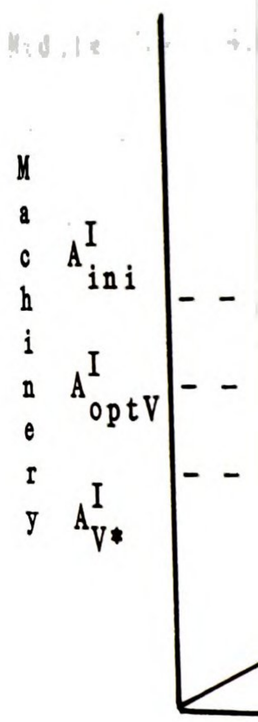

Figure 5

proceed to the voluntary asset iteration routine to determine the percentage of assets to liquidate, an amount between 0 and 20 percent. Graphically, the optimal solution is represented by points A^{I}_{optV} and A^{L}_{optV} in Figure 5-12.

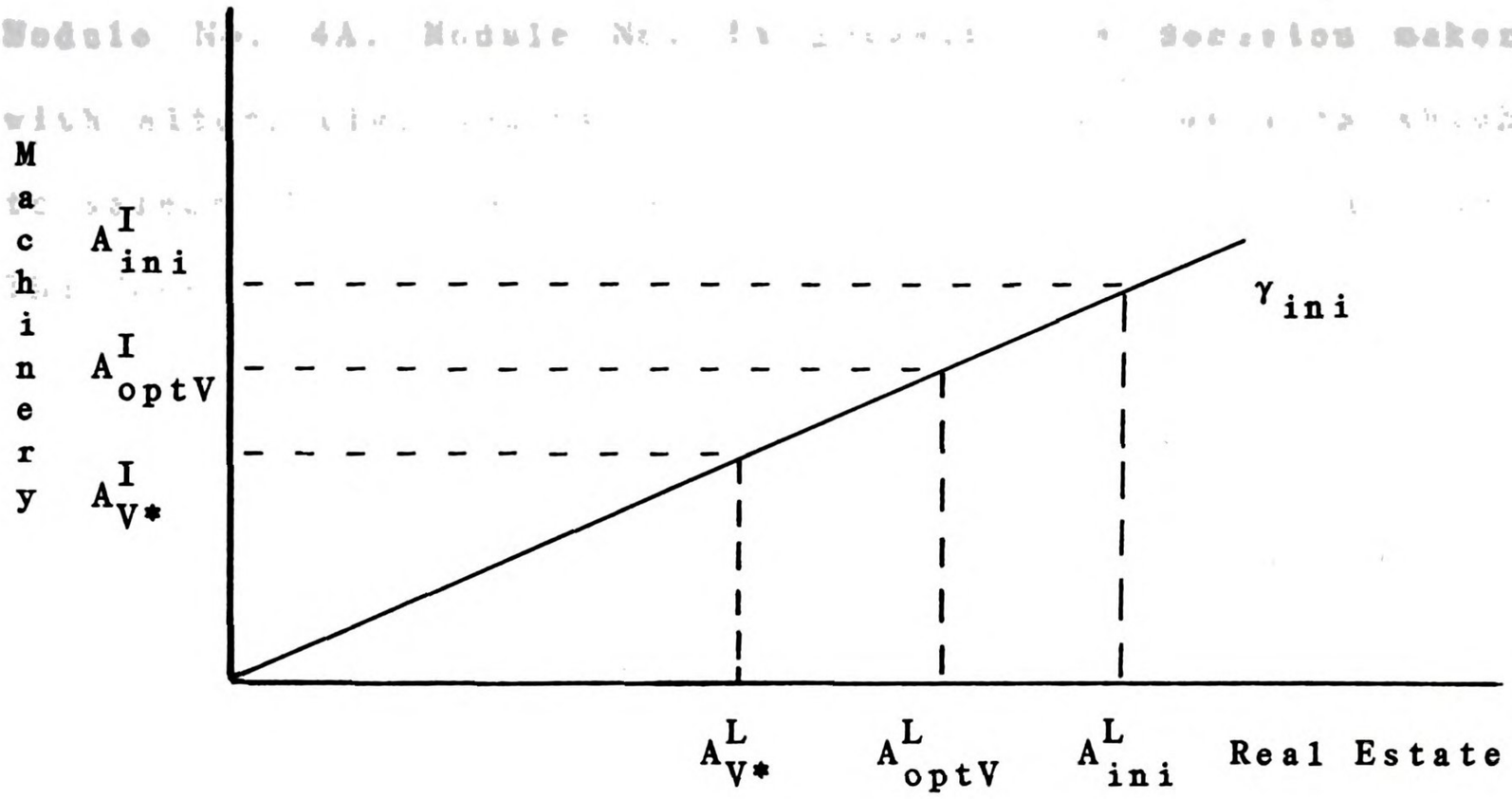

Figure 5-12 Mapping The Voluntary Asset Liquidation Optimal Debt Search Process For The Initial Machinery/Real Estate GAMMA1 Ratio

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5.11.7 Selection of The Firm's Optimal Debt Position: A Discussion of Alternative Selection Options

When the program has completed the search procedure for the optimal debt position, having evaluated the initial GAMMA1 ratio and each of the GAMMA1 ratios between .075 and .45 (by an increments of .025), the program proceeds to Module No. 4A. Module No. 4A presents the decision maker with alternative optimal debt selection options from which to select the firm's operational strategy for the next year. The four selection options include:

- Expand operations to the recommended optimal debt position
- Liquidate assets to meet the reduced recommended optimal debt position
- Maintain operations at the current level- do not alter the firm's current financial position
- Prepay debt with available cash to reduce the firm's probability of bankruptcy

For the two selection options involving expanding and reducing the scale of the firm's operations, the decision maker is presented with summary financial data from the optimization routine. Table 5-6 highlights the financial information presented to the decision maker for expanding the firm's operations and thus its debt position. After the

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Table 5-6 Decision Screen For Selecting The Firm's Optimal Debt Structure and Asset Purchase[6]

Firm's Optimal Debt Structure and Asset Purchases: 1988

Firm's Optimal Total Debt	$732,200
Firm's Current Debt Position	525,000
Recommended Additional Debt	$207,200

Based on the input parameters, to maximize after tax equity position the firm should lease or purchase the following additional assets:

Category	Lease/Purchase Price	Cash Required	Debt Required
Cash Leased Land	$ 30,000	$ 15,000	$ 15,000
Purchase Land	200,000	40,000	160,000
Machinery	46,000	13,800	32,200
Totals:	$ 276,000	$ 68,800	$ 207,200

Note: Cash Payment For Leased Land Comes From Operating Line Of Credit

Negative Machinery Purchase Indicates a Reduction From Current Inventory Level

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decision maker has reviewed the model's proposed optimal debt recommendation, pressing 'C' to continue clears the top portion of the screen. The detailed recommendations contained in Table 5-6 then appear at the top of the screen while a data input screen similar to Table 5-7 is displayed in the lower half of the computer display.

Table 5-7 Decision Maker Selection Input Screen

Select Up To The Indicated Dollar Amount

Rental Land: _____

Purchase Farm Land: _____

Machinery: _____

Total Value of Leased and Purchased Assets: _____

Do You Want To Make A Purchase (Y/N) ?

After the decision maker enters the asset acquisition choice(s) for the next operating cycle, the program updates the firm's balance sheet and proceeds to Module 5 to simulate the operating results for the year. For the case where the firm's initial debt position is greater than the

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Table 5-8 Decision Screen For Selecting The Firm's Optimal Debt Structure and Asset Liquidation[7]

Firm's Optimal Debt Structure and Asset Liquidation: 1988

Firm's Optimal Total Debt	$525,000
Firm's Current Debt Position	732,200
Recommended Prepaying This Debt	$207,200

Based on the input parameters, the firm has exceeded its optimal debt position and should liquidate assets and prepay debt as indicated:

Category	Amount to Liquidate	Liquidation Costs	Debt Reduction
Cash Leased Land	$ 15,750	$ 750	$ 15,000
Purchase Land	188,200	28,200	160,000
Machinery	35,800	3,600	32,200
Totals:	$ 239,750	$ 32,550	$ 207,200

Press <C> to Continue

7. The financial data presented in Table 5-8 is for illustrative purposes only.

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recommended optimal debt, the program displays recommended asset liquidations in the same format as in Table 5-8.

After the decision maker has reviewed the model's recommended asset liquidations, pressing 'C' to continue clears the summary data presented in upper portion of the screen. The detailed recommendations contained in Table 5-8 then appear at the top of the screen while a data input screen similar to Table 5-7 is displayed in the lower half of the computer display.

As with the expansion of debt option, after the decision maker has entered asset liquidation choice(s) for the next operating cycle, the program updates the firm's balance sheet and proceeds to Module 5 to simulate the operating results for the year.

The third option the decision maker may select involves doing nothing. That is, the firm maintains its prior year financial position. From a pedagogical perspective, the decision maker has the opportunity to assess the effect of the firm's financial performance (given the lender's credit policies, the firm's initial and internally generated capital resource endowments, and stochastic yields and prices) on the decision maker's end-of-period wealth position.

The fourth selection option involves prepayment of debt. The decision maker can prepay current, intermediate, and long term debt if the firm has surplus cash available. Table 5-9 displays the format and sample financial informa-

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Table 5-9 Debt Prepayment Selection Input Screen

Total Cash Available To Reduce Debt: 35,500

Prepay Current Liabilities: _____

Prepay Intermediate Liabilities: _____

Prepay Long Term Liabilities: _____

Total Prepaid Debt: _____

Do You Want To Make A Debt Prepayment (Y/N) ?

While selection of the debt prepayment option nullifies the optimization routine's selection of the optimal debt position for the firm, this option allows the decision maker to analyze the impact of reduced financial leverage on the financial position and performance of the firm.

5.11.8 Summary

While the program provides the decision maker with a great deal of decision making flexibility to select between the various optimal debt options, it is not possible to do side-by-side comparisons of alternative optimal debt strategies to assess their effects on the decision maker's end-of-period wealth position. Precise duplication of the

model's simulated yields and prices and thus the rate of return on the firm's total assets cannot be guaranteed from one cycle to the next, because of the variability introduced as a result of the stochastic properties of the model.

5.12 Reporting

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5.12 Reporting Financial and Production Results

The simulation model is designed to provide the user with model results and output data both on the screen and in hard copy format as each module of the program is run. The user has the option at the end of the production cycle to view the firm's simulated financial and operating results for the period, and if desired, obtain a hard copy of any of eight preformatted management reports. The management reports include:

1. **Balance Sheet Summary:**

   -This report provides a summary of the firm's financial position at four key points in time during the production cycle (e.g. 12/31/86, 1/1/87 before and after decision making, 12/31/87).

   -The financial data provided summarizes:

      -total assets
      -total liabilities
      -debt-to-equity ratio
      -restricted credit reserves
      -maximum credit reserves
      -minimum credit reserve requirements

   -The rate of return on total assets that will result in exhaustion of the firm's restricted credit reserve and bankruptcy

   -The maximum operating loss the firm can incur before exhausting both the restricted credit reserves and experiencing bankruptcy.

2. **Financial Management Summary:**

   -This report provides a summary of key financial variables including:

      -the four restricted credit reserves
      -probability of bankruptcy
      -cash flow exposure
      -total assets purchased during the cycle
      -scheduled principal and interest on intermediate and long term debt

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3. Income Statement:

-This report provides a detailed summary of farm revenue and major expenditures by revenue and expenditure category

-Net farm income from operations

-Net farm income before tax but after asset liquidation

-Net income after tax for the period

4. Sources and Uses of Cash Statement:

-This report provides a summary of all of the decision maker's cash in and out for the period including:
- -farm operation
- -non-farm cash demands
- -new intermediate and long term debt
- -asset purchases and sales
- -family living
- -taxes

-Total cash required, net cash flow and forced asset liquidation, if any, are highlighted for the user.

5. Operational Summary Statistics:

-This report provides the user with a detailed summary of:
- - current assets liquidated
- - intermediate assets liquidated
- - real estate assets liquidated

These assets are liquidated in order to balance the firm's credit reserve accounts based on the lender's credit policies, during the optimization routine

-Forced asset liquidation required to avoid bankruptcy or to meet minimum credit reserve requiremnts

-Total cost of liquidating assets

-Selected financial ratios

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6. Lender Input Summary:

-This report provides a detailed listing of all credit policy variables by liability category, including:
  -current liabilities
  -intermediate liabilities
  -long term liabilities

-Credit variables summarized include:
  -interest rates
  -liquidation premium percentages (ρ)
  -leverage variables (δ)
  -cash down payment percentages
  -amortization terms
  -minimum credit reserve requirements

7. Production and Marketing Summary

-This report summarizes:
  -total acreage for each crop
  -cash variable production expense per acre
  -expected price
  -expected yield
  -expected gross margin per acre
  -percent of crop forward contracted
  -specifics concerning All-Risk Crop Insurance including guaranteed yield, indemnity price, premium cost, odds of payoff for the strategy chosen, and cash flow exposure for the firm's corn and soybean production.

8. Optimization Matrix Summary

-This report was designed primarily for use by researchers and those individuals interested in the intricate details of the optimization solution routine. For each GAMMA1 evaluated, the report prints the intermediate results for EU#, ACTEU, along with the recommended asset purchases or liquidations for that particular GAMMA1 ratio.

In summary, the software's is designed to provide users with the ability to generate both individual reports or the entire set of reports formatted to print on 8.5 by 11.0 inch paper by pressing a single key. For pedagogical purposes the

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set of preformatted management reports include the basic financial statements including balance sheets, income statements and sources and uses of cash statements, along with detailed operational summaries of interest primarily to researchers and college students. Appendix C contains a complete set of the eight management reports described in this section.

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CHAPTER 6

DATA SOURCES FOR THE SIMULATION MODEL

6.1 Introduction

This simulation model, like most complex simulation models, requires a substantial amount of financial, production and macro economic data to operate. However, unlike many comparable simulation models, this model was designed to minimize the data entry requirements for the user while providing a 'user friendly' operating environment for pedagogical purposes. In order to accomplish these objectives most of the macro economic data, such as expected rate of inflation, annual corn and soybean price forecasts and baseline corn and soybean enterprise budgets, were incorporated into the model during the initialization routine. Firm specific data, including financial condition, initial resource endowments, family consumption patterns, tax data, availability of additional tillable land and the firm's lender credit policy data, must be entered by the user. The computer model provides the user with a friendly operating environment complete with background information, input data screen prompts and selective input data error trapping protection. This simulation model was designed using a systems approach for dealing with the intricacies of deci-

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sion making under uncertainty while providing a 'user friendly' operating environment. The model will serve as an excellent training tool for educating agricultural decision makers on the complexities of financial management under uncertainty.

This chapter first examines the development of cost of production relationships, including variable and fixed costs. Then, the discussion turns to the development of random yields and prices, land values and the availability of additional tillable acreage. Finally, the macro economic variables required by the model are discussed, including the inflation rate and selected interest rates.

6.2 Cost of Production Data

6.2.1 Total Production Cost Relationships

Total production costs for the firm include variable costs incurred for corn and soybean production, fixed costs which are independent of the level of production over relevant output ranges, the opportunity costs of capital, machinery ownership costs, and land ownership and rental charges. An expression for the firm's total cost of production is:

$$(6.1) \qquad TC = TVC + TFC$$

where

TVC = Total variable costs

TFC = Total fixed costs

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The firm's total fixed costs include building repairs, real estate taxes, machinery ownership costs, land ownership costs and the opportunity costs of capital. Equation (6.1) represents a static relationship which holds for the current period. **A dynamic total cost relationship** can be specified as follows:

$$(6.2) \quad TC_t = TC_{t-1} * (1.0 + \xi_1)$$

where

ξ_1 = a parameter for the annual rate of increase of total costs, $0 < \xi_1$.

Dynamic, in this context, refers specifically to the fact that the current period value(s) for each cost variable depends upon past values of the variable. The computer model provides the decision maker with the flexibility to insert different rates of cost increase for each of the various factors of production, e.g. variable costs, land rent, owned land and machinery replacement.

6.2.2 Variable Costs of Production

These costs are often referred to as the total out-of-pocket expenditures incurred to produce a unit of output, over which the decision maker has complete control. Variable production costs for both corn and soybean production in the model are summarized into twelve cost categories, including hired/paid labor, machinery repair, seed, fertilizer, chemicals, other crop expenses, utilities, custom hire, fuel and

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oil, drying fuel, trucking and freight and miscellaneous. Total variable costs per acre for corn production can be expressed as:

$$(6.3) \qquad TVCC = X_i P_i$$

where

TVCC = Total Variable Costs for Corn

X_i = quantity of each input used per acre

P_i = price of X_i per acre

The first requirement involves selection of the most appropriate variable cost data set. As noted by Miller and concurred Skees 'there is a surprising variation in costs among farms - a variation that is, except for the smallest units, not related to size. In fact, there is much more variation within than between size groups. Martin went on to state that such variation is due to differences in technology, in management ability, and in resource productivity ..... Such factors appear to be much more important than size in causing cost differences among commerical farms' (p. 111).

The individual variable cost enterprise budget data selected for use as a baseline in the model as baseline data was obtained from the publication 'Estimated Budgets for Michigan Crops and Livestock, 1988' by the Agricultural Economics department at Michigan State University. The variable cost data in the report was obtained from two primary sources. Seed, fertilizer, and chemical costs are

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based on current ingredient costs from commerical sources. The other variable cost factors in the enterprise budgets were obtained from 1987 Telfarm yearly summary data. The actual 1987 variable cost data was increased to reflect 1988 price levels.

With the MSU enterprise budgets serving as the baseline variable cost data for crop production, the simulation model differentiates for technological differences through the management of the firm's farm equipment investment strategy. Furthermore, economies of scale and size are considered through the use of volume discounts based on total crop acreage planted. This aspect of the model is discussed in detail in section 6.2.4 of this chapter.

The decision maker has the flexibility within the computer model either to individually enter each of the twelve variable cost factors for both corn and soybeans or to select the most appropriate crop budget from three pre-entered enterprise budgets based on the firm's expected average yield. For corn, the model provides baseline variable cost budgets for expected yields of 80, 100, and 120 bushels. Table 6-1 presents the three baseline budgets for corn for 1988. For soybeans the baseline budgets are for expected yields of 25, 30 and 40 bushels. Table 6-2 highlights the three 1988 baseline budgets for soybeans.

With regard to labor hours and labor expense, the model assumes there is one full-time operator with 2,080 hours available annually. The MSU crop enterprise budgets indicate

Table 6-1 1988

Input No.	Input V
1.	Hired/pai
2.	Machinery
3.	Seed
4.	Fertilize
5.	Chemicals
6.	Other cr
7.	Utilitie
8.	Custom h
9.	Fuel and
10.	Drying f
11.	Trucking
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Table 6-2 198

Input No.	Input
1.	Hired/p
2.	Machine
3.	Seed
4.	Fertil
5.	Chemic
6.	Other
7.	Utilit
8.	Custom
9.	Fuel a
10.	Drying
11.	Trucki
12.	Miscel
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Table 6-1 1988 Baseline Variable Cost Budgets for Corn

Input No.	Input Variable	Cash Expense Per Acre 80 Bu.	100 Bu.	120 Bu.
1.	Hired/paid labor	36.30	37.00	37.60
2.	Machinery repair	20.50	20.50	20.50
3.	Seed	18.20	19.60	21.00
4.	Fertilizer	26.70	31.50	44.70
5.	Chemicals	15.20	15.20	15.20
6.	Other crop expenses	.80	1.00	1.20
7.	Utilities	2.00	2.50	3.00
8.	Custom hire	0	0	0
9.	Fuel and oil	9.80	9.90	10.00
10.	Drying fuel	24.00	30.00	36.00
11.	Trucking and freight	16.00	20.00	24.00
12.	Miscellaneous	0	0	0
	TOTAL:	169.50	187.20	213.20
	Hours of labor	5.50	5.60	5.70

Wage rate: 5.50 per hour
Fringe benefits: 20 percent of wage rate

Table 6-2 1988 Baseline Variable Cost Budgets for Soybeans

Input No.	Input Variable	Cash Expense Per Acre 25 Bu.	30 Bu.	40 Bu.
1.	Hired/paid labor	23.75	24.40	25.10
2.	Machinery repair	17.50	17.50	17.50
3.	Seed	12.00	12.00	12.00
4.	Fertilizer	11.50	11.50	15.50
5.	Chemicals	17.90	17.90	17.90
6.	Other crop expenses	.25	.30	.40
7.	Utilities	1.50	1.50	1.50
8.	Custom hire	0	0	0
9.	Fuel and oil	8.80	8.90	9.00
10.	Drying fuel	0	0	0
11.	Trucking and freight	5.00	6.00	8.00
12.	Miscellaneous	0	0	0
	TOTAL:	98.200	100.00	106.90
	Hours of labor	3.60	3.70	3.80

Wage rate: 5.50 per hour
Fringe benefits: 20 percent of wage rate

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total hours of required labor, without taking into account available operator or family labor. Based on the default crop mix of 50:50, the average hours of labor required per acre is 4.75 hours, at a cost of 6.60 per hour (refer to Tables 6-1 and 6-2 for details). Based on 2,080 hours of operator labor available annually, no hired labor is required when total corn and soybean acreage is less than 438 acres. Thus, when total acreage is less than 438 acres, the model excludes hired labor from the total crop production expenses. It is assumed that reimbursement for operator labor is accounted for by the planned family living withdrawal.

After selecting the most appropriate baseline budget for corn and soybeans, the decision maker has the option to utilize each of the twelve baseline cost factors or to conveniently customize any or all of the twelve input costs for his/her particular situation.

In addition to the twelve variable production costs per acre, the model calculates internally the firm's operating or production loan interest payment. Interest paid on the firm's crop production loan is also a variable production expense. One of the major financial assumptions built into the simulation model is that all of the firm's crop production inputs are financed 100 percent with operating loan proceeds, regardless of the firm's available cash position. Calculation of total operating loan interest is based on several factors, including the decision maker's selection of

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the appropriate production expenditures per acre for each crop, the premium cost associated with the level of All-Risk Crop Insurance purchased (if coverage is selected), and the total number of acres of each crop planted. Calculation of operating loan interest is based on an expected six-month term for the production loan and the expenditure pattern for the various production inputs.

6.2.3 Variable Production Input Expenditure Patterns

During the simulation process the computer model provides intermediate operational and financial information that can be used by the decision maker to assist in making key management decisions. Examples of the type of information the model generates based upon the variable cost production expenditure data include the break-even yield required before considering the harvesting of each crop and the firm's cash flow exposure position both with and without All-Risk Crop Insurance coverage for each crop.

The expenditure timing pattern for each of the twelve variable production inputs must be established in order to calculate the firm's cash flow exposure position for each crop and the break-even yield required to consider harvesting of each crop. For complete details regarding the calculation of the firm's cash flow exposure position refer to Chapter 5, section 5.11.2, Managing Production Risk. The expenditure patterns built into the model for each of the twelve variable production costs are summarized in Table 6-

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3. Identical expenditure patterns are utilized for both corn and soybean variable production costs.

Table 6-3 Expenditure Patterns for Variable Production Costs

Input No.	Variable Cost	Timing of the Expenditure (% of total) Planting	Harvest
1.	Hired/paid labor	25	75
2.	Machinery repair	25	75
3.	Seed	100	0
4.	Fertilizer	100	0
5.	Chemicals	100	0
6.	Other crop expenses	0	100
7.	Utilities	25	75
8.	Custom hire	25	75
9.	Fuel and oil	50	50
10.	Drying fuel	0	100
11.	Trucking and freight	25	75
12.	Miscellaneous	25	75

The formula used to determine the break-even yield required to consider harvesting a crop can be expressed as:

$$(6.4) \qquad BEHYC = \frac{(BEHYCN1 + BEHYCN2)}{EPC}$$

where

BEHYC = Break-even yield for corn
BEHYCN1 = ((1+2+7+8+11+12)*.75 +(9*.5) +6 +10)
BEHYCN2 = ((1+2+7+8+11+12)*.25 +(9*.5) +3 +4 +5)*IN.C*.5)
EPC = Expected price per bushel of corn
IN.C = Fixed interest rate on the operating loan

The numbers in the BEHYCN1 and BEHYCN2 formulae refer to the input numbers associated with the variable costs listed in Table 6-3. This approach is also used for the soybean break-even yield necessary to consider harvesting.

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6.2.4 Variable Input Economies of Scale and Size

No attempt is made in this model to determine the optimal quantity of each individual variable input to use. That is, the model does not solve for the optimal combination of variable production inputs to achieve a 1:1 ratio between each variable input's marginal value product to it's input price. Equation (6.5) highlights this optimal relationship for the twelve variable inputs:

$$(6.5) \quad \frac{MVP_{x1}}{MFC_{x1}} = \frac{MVP_{x2}}{MFC_{x2}} = ... = \frac{MVP_{x12}}{MFC_{x12}} = 1$$

It is assumed that the decision maker has decided on the internal economies of scale, that is, the least cost combination of inputs per acre (e.g. quantity of nitrogen to phosphate) for both corn and soybean production, before selecting or modifying the variable cost per acre crop budgets in the computer model.

With regard to external economies of size, the model provides the decision maker with volume pricing incentives for three of the major inputs -- seed, fertilizer and chemicals -- based on the total number of acres planted. Research studies have shown that large farmers are able to purchase production inputs at lower prices than smaller farmers (Faris and Armstrong, Krause and Kyle, and Hall and LaVeen). A survey of Ohio crop farmers by Zulauf and King revealed that for seed, fertilizer and pesticides, Ohio farmers realized a monetary advantage as the size of the farms

increased. Tab

Table 6-4

Input	1
Seed	
Fertilizer	
Pesticides	

Source: Zulauf

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increased. Table 6-4 summarizes Zulauf and King's findings.

Table 6-4 Average Discount Reported by Farm Operators on Seed, Fertilizer, and Pesticides by Farm Size

Input	Acres 100-179	180-259	260-499	500-999	>1000
Seed	2.4%	3.6%	4.3%	6.5%	10.8%
Fertilizer	2.2%	2.2%	2.8%	3.6%	6.6%
Pesticides	1.4%	2.3%	2.2%	3.0%	7.8%

Source: Zulauf and King, 1983.

The computer model's variable production cost subroutine incorporates Zulauf and King's findings regarding external economies of size for the selected inputs. The model calculates the pricing discounts for the decision maker based on the corn and soybean acreage selected.

6.2.5 Fixed Costs of Production

Total fixed costs are of significance only in the length of run which fixes the available quantity of these inputs. Therefore, in any given length of run those input components which are classified as being fixed are committed to the production of the product under consideration. The firm's total fixed costs can be expressed as:

$$TFC = X_i P_i \qquad (6.6)$$

where

X_i = quantity of input used

P_i = price per unit of X_i

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In this model a key assumption is that the firm's total fixed costs are held constant for all levels of output over the length of run being studied, once the required ratio of equipment investment to the value of total crop acreage is determined. In this model the length of run is one production cycle. The model provides for adjustment of the firm's fixed cost structure on January 1 and December 31st of each year based on machinery and real estate investment decisions and the firm's net cash flow position for the period.

Fixed costs contained in the model for which the decision maker must enter data include:

1. Land rental payments
2. Real estate taxes
3. Building repairs
4. Insurance (non-crop)
5. Other

The model also includes several additional fixed cost expenditures which are calculated for the decision maker based upon the various production and investment decisions made during the simulation process and the firm's beginning-of-period financial data. These additional fixed costs include:

1. Intermediate debt interest payment
2. Real estate debt interest payment
3. Depreciation (non-cash)

6.3 Procedures
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6.3 Procedures Used to Generate Random Commodity Yields and Prices

6.3.1 Parameters Used to Develop Commodity Yields

The model provides the user with complete flexibility for establishing the subject farm's historical yield base for both corn and soybean production. During both the initial production and the All-Risk Crop Insurance data input routines the user is asked to enter average yield data for the previous five years for both corn and soybean production. The expected yield estimates generated by the model are based on a combination of a theoretical maximum yield concept and the subject farm's actual yield trends for the past five years.

The theoretical maximum yield per acre is based on the premise that with the optimal combination of land resources, age and condition of the farm's field equipment, technological advances available to the decision maker through technical assistance, extension education, and the optimal combination of production inputs (refer to equation (6.5)), the decision maker can increase the farm's trend yield toward a maximum yield potiential. The following expression summarizes this theoretical maximum yield concept:

$$(6.7) \quad YLD_{max} = K_0 e^{\alpha}$$

where

K_0 = Trend Yield and Technology Factor
e = Natural Log (2.71828)
α = Ratio Between Fixed Factors of Production

Based on equation (6.7) the decision maker's crop yields have the potential to increase or decrease from the respec-

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tive trend yields as a result of two major factors: the introduction of improved techological advances and the ratio between field equipment and tillable land, as expressed by the α term. Figure 6-1 graphically presents this relationship and highlights the theoretical limit or maximum yield that can be attained for any crop.



Figure 6-1 Illustration of the Theoretical Maximum Yield Based on Increasing the Production Input Ratio

An annual rate of change for projecting subsequent corn and soybean yields can be estimated by analyzing the last 24 years of average Michigan corn and soybean yield data. The slope coefficient obtained through the use of regression analysis for each crop is then incorporated into the appropriate yield equation as a proxy for the annual rate of change to the subject farm's trend yields. Equation (6.8) projects the subject farm's corn yield:

$$TYLDC = TMCC + (2*B_c) + B_c*\text{Cycle No.} \quad (6.8)$$

where

TMCC = Three-Year Trimmed Mean Yield
B_c = Slope Coefficient for Corn, (1.6735)

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The same equation is used for projecting the trend yield for soybeans, with one minor modification: the substitution of an annual rate of change coefficient of (1.6735) and soybean (.4115) yields are consistent with the annual rate of change coefficients derived by Skees for Illinois corn (1.8) and soybean (.5) yields respectively.

Once the subject farm's trend yield is estimated based on a combination of the farm's three-year trimmed mean yield and the long term average annual yield increase for Michigan, the model then projects the firm's theoretical maximum yield for the planning period:

$$YLDC = TYLDC*1.15*(1-LN^{(-8.25*\alpha)}) \quad (6.9)$$

where

YLDC = Maximum Yield for Corn

$$\alpha = \frac{\text{Value of Intermediate Assets}}{\text{Value of Owned Land + Rented Land}}$$

The α ratio is defined as the relationship between the firm's total investment in intermediate assets, which for a crop farm is composed primarily of field and crop equipment, and the value of the firm's total tillable acreage, including owned and rented acreage. The assumption is that as the ratio of investment in field equipment to the value of total tillable acreage increases, it reflects both an increased investment in state-of-the-art equipment and an increasing inventory of field equipment which can be used to respond to required field operations in a more efficient and timely manner. Obviously, there are costs involved with too low an

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investment ratio, as well as one that is too high. The model requires the decision maker to maintain a minimum acceptable ratio of value of machinery to total tillable land at the beginning of each production cycle. With regard to the costs involved with maintaining too high a ratio, the model's optimization routine solves for the optimal ratio between investment in machinery and the value of total tillable acreage.

The 1.15 coefficient or 15 percent technological growth factor represents this author's subjective estimate of the maximum technological growth potential per acre. This 15 percent growth factor is in addition to the annual rate of change coefficient.

After making all of the planning and investment decisions the model proceeds to simulate the stochastic corn and soybean yields for the fiscal planning period. The following equation is used to generate the subject farm's stochastic corn yield:

$$(6.10) \qquad STOYC = SDC*RV(I) + TYLDC*1.15*(1-LN^{(-8.25*\alpha)}$$

where

STOYC = Stochastic Corn Yield
SDC = Corn Yield Standard Deviation
RV(I) = Random Normal Variate Number

The model's stochastic yield equations are based on the same logic and algorithms for drawing bivariate normal random crop yields as contained in Griffin and Black's All-Risk Crop Insurance Evaluation Program-(ARCIE). Therefore, when a simulation run is made the expected yields for the period

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are adjusted either up or down by the random draw for that period. The stochastic soybean yield is generated with the following equation:

$$(6.11) \quad STOYS = SDS*(CC1*RV(I) + ((1-CC1*CC1)^{.5}) * RV(I) + TYLDS*1.15*(1-LN^{(-8.25*\alpha)})$$

where

STOYS = Stochastic Soybean Yield
SDS = Soybean Yield Standard Deviation
CC1 = Correlation Coefficient Between Corn and Soybean Yields

The model utilizes the corn and soybean stochastic yields to determine the total quantity of grain produced for marketing purposes, All-Risk Insurance payoffs, if any, and ultimately the firm's net cash flow position for the year.

6.3.2 Development of Random Commodity Prices

The model relies on both exogenously generated annual corn and soybean prices for the 1988-1997 planning period, and endogenously simulated stochastic commodity prices for the current planning period. It is beyond the scope of this research project to forecast annual commodity prices. Instead, the model utilizes the annual U.S. corn and soybean price forecasts generated by AGMOD, a model developed by Dr. John Ferris et.al., of the Department of Agricultural Economics at Michigan State University. The AGMOD model is a 207-equation, 300-variable micro based model developed within the statistical framework of Micro TSP (version 5.0). Micro TSP has the capability of solving both linear and nonlinear systems of equations based on the Gauss-Seidal

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solution method. The basic structure of the AGMOD model is similar to the MSU Agriculture Model, but with much less detail, especially with regard to the international component, according to Ferris.[1]

The MSU Agriculture Model was developed on a mainframe computer in the mid-1970s to mid-1980s. It contains a comprehensive supply and demand international sector which is fully integrated with the domestic supply and demand component. Both the MSU Agriculture Model and the AGMOD model rely on the Gauss-Seidel solution methodology.

Table 6-5 presents a summary of historical corn and soybean prices for the period 1980-1987 and projected prices for the period 1988-2000. These exogenously generated commodity prices are inputted into the model during the data initialization process in module 1.

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1. The structural sophistication of the MSU Agriculture Model provides for integration of domestic and international macroeconomic variables such as commodity production patterns, agricultural trade data, domestic commodity utilization rates, and ending stocks for the major livestock and feed grains produced in the world. The MSU Agriculture Model included both the supply and demand relationships for the major agricultural commodities grown, and allows for the incorporation of the latest domestic and international agricultural policies.

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Table 6-5 Annual U.S. Corn and Soybean Prices: 1980-1997

Year	Corn	Soybeans
	Actual	
1980	3.11	7.57
1981	2.50	6.04
1982	2.68	5.69
1983	3.25	7.81
1984	2.62	5.85
1985	2.35	5.10
1986	1.50	4.80
1987	2.00	6.20
	Projected	
1988	2.97[1]	9.20
1989	2.88[2]	9.32
1990	2.46	8.62
1991	2.71	7.73
1992	2.61	7.49
1993	2.51	7.77
1994	2.42	7.97
1995	2.63	7.99
1996	2.62	8.17
1997	2.68	8.27

[1]: 1988 Corn price of 2.97 includes deficiency payment of 17 cents per bushel
[2]: 1989 Corn price of 2.88 includes deficiency payment of 55 cents per bushel
Source: AGMOD, July 1988.

The credit reserve model uses the AGMOD's U.S. corn and soybean prices as the basis for the expected annual commodity prices and generation of the stochastic crop prices for the planning period. The decision maker has the flexibility to adjust the baseline crop prices by a preset tolerance level. For corn, the adjustment tolerance is +/- 50 cents, while for soybeans the adjustment tolerance is +/- one dollar. This additional built-in flexibility provides the decision maker with the discretion to adjust the ex-

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The expected corn and soybean prices for the current planning period are estimated by seasonally adjusting the annual corn and soybean prices for each crop's primary month of harvest. Ferris has shown that for the period 1958-1982, the expected price of corn in Michigan during the month of November, the primary harvest month for corn grain, averaged 91.8 percent of the annual average corn price. November's average corn price index is the lowest percentage for any month during the year. This finding is consistent with the fact that the cash price for corn in most years will decline to its lowest level during the crop's primary harvest month. Further, Ferris states that few years are really 'normal' and that the pattern of price movement can vary substantially from year to year. Ferris' analysis of Michigan's seasonal price trends for corn and soybeans is consistent with the seasonality observed for cash corn and soybean price movements on the Chicago grain market for the period 1960-1983.

Based upon Ferris' results the expected price for November corn in the model is calculated as follows:

$$EPC = (CRNPR * .918) + (.001 * CYCLE * CRNPR) \quad (6.12)$$

where

EPC = Expected November Cash Corn Price
CPNPR = Expected Annual U.S. Corn Price
CYCLE = Year being simulated (e.g. 1-10)

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The .1 percent adjustment factor reflects Ferris' finding of the annual rate of change in the November seasonal price index for corn over the 1958-1982 period.

For soybeans, October is the primary harvest month in Michigan. The expected price of soybeans in the model is calculated as follows:

(6.13) $$EPS = (SYBPR * .954) + (.001 * CYCLE * SYBPR)$$

where

EPS = Expected October Cash Soybean Price
SYBPR = Expected Annual U.S. Soybean Price
CYCLE = Year being simulated (e.g. 1-10)

The October soybean seasonal price index over the 1958-1982 period also increased by an annual rate of .1 percent. The impact of this long term trend is incorporated into the expected price equation through the second term in equation (6.13). The equation for the stochastic price for corn is:

(6.14) $$STOPC = SDPRC*RV(I) + EPC$$

where

STOYC = Stochastic Corn Price
SDPRC = Standard Deviation of the Seasonally Adjusted Corn Price
RV(I) = Random Normal Variate Number

The stochastic soybean price is generated with the following equation:

(6.15) $$STOPS = SDPRS*(CC2*RV(I) + ((1-CC2*CC2)^{.5}) * RV(I) + EPS$$

where

STOYS = Stochastic Soybean Price
SDPRS = Standard Deviation of the Seasonally Adjusted Soybean Price
CC2 = Correlation Coefficient Between Corn and Soybean Prices

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Ferris found a .068 standard deviation for the November corn price index relative to the annual corn price index for the 1958-1982 period for Michigan. For the same time period, the standard deviation for the October soybean price index relative to the annual soybean price index was .102. These standard deviation values were incorporated into the simulation model.

6.3.3 Crop Mix Selection Strategies

The model is programmed to default to a 50:50 corn to soybean crop mix. The decision maker is given the option to shift the crop mix by +/- 10 percent. This relatively narrow crop mix adjustment range was determined after a review of the literature and discussions with MSU crop specialists.

Previous research studies involving cash grain farm simulation models have employed similar assumptions regarding the most appropriate corn/soybean crop mix. Skees' corn/soybean farm simulation model allows for total crop mix adjustment, but a range of 30 to 70 percent between corn and soybeans was fixed over the 10 year planning horizon. Gabriel developed a multi-year linear programming model for central Illinois grain farms and fixed the corn/soybean crop mix at 66 percent corn and 33 percent soybeans. Leatham modeled a midwest crop-livestock farm utilizing multi-period discrete stochastic programming methodology. Leatham utilized a fixed 50:50 corn to soybean crop mix.

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MSU crop specialists were quick to point out that a typical corn/soybean farmer does not have complete flexibility to switch crop acreage due to year-to-year herbicide residue carryover. The decision maker must take appropriate precautions to adjust herbicide application rates at least one year prior to planned rotation. As a result of these findings, the option to vary from the model's 50:50 default corn/soybean crop mix was limited to +/- 10 percent.

6.4 Agricultural Land Values and the Availability of Additional Tillable Acreage

6.4.1 Introduction

What is farmland worth? Michigan farmland increased dramatically in value between 1970 and 1980. The large annual percentage increases during this period were attributed to a number of factors, including optimism about the future of the agricultural economy, rapidly expanding grain export markets, rising commodity prices, increasing net cash margins per acre and tremendous growth in farmer's equity, due in large part to capital gains. In addition, farmers had ready access to real estate credit to finance farmland acquisition, with many agricultural lenders willing to loan up to 85 percent of the land's purchase price and in many cases offering 25 to 40-year amortization periods on the loans. While nominal long term interest rates began to rise during the mid 1970s, real interest rates averaged just over one percent during this period.

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The macro economic environment for the general economy, and for the agricultural sector in particular, began to change dramatically in 1980. As a result of monetary policy changes implemented by the Federal Reserve Bank in 1979, the real rate of interest gradually increased to 2.2 percent by 1980 and 9.0 percent by 1985. As a consequence of the continued strength in the U.S. dollar agricultural exports declined sharply during this same time period. With U.S. grain stocks approaching 20-year highs, and weak export demand, farm grain prices declined to government price support levels. All of these factors contributed to the 50 to 60-plus percent decline in farmland prices throughout the corn belt. In Michigan land values declined 34.8 percent through 1987 before stabilizing and rising a modest 2.4 percent in 1988.

6.4.2 Valuation of Owned Agricultural Land

A standard technique often used for determining farmland values is to capitalize the expected net return per acre at some discount factor. This widely used method of valuation is referred to as the capitalization formula.

Equation 6.16 highlights the capitalization formula:

$$V_t = R_t / r \qquad (6.16)$$

where

V = Value per acre
R = Net return per acre
r = discount rate (individual's time preference rate)

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In a world without inflation, r, the discount rate, is the investor's time preference rate of return, or the rate of return which the investor could earn from the next best use of the money. A proxy often used for the net return per acre is the cash rent received.

In order to test the ability of the capitalization formula to explain land value trends, Espel estimated equation (16) using ordinary least squares and 20 years of Michigan data for the period 1960-1980. Espel concluded that equation (6.16), a single variable equation, performed reasonably well. The single variable equation yields a coefficient of determination, (R^2), of 91 percent, with a t statistically significant at all confidence levels. Espel, who also utilized cash rent as a proxy for the net return per acre, concluded based on his estimation of equation (6.16) that land should be priced at approximately 18 times its current earnings. Espel concluded that the coefficient on R_t was not very far out of the expected range, yielding a value for r of about 5.6 percent. Table 6-6 presents the average land value in Michigan, average cash rent per acre and the ratio of the average value per acre to cash rent for the period 1970-1988.

Table 6-6 I

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Table 6-6 Michigan Cash Rent and Farmland Values: 1970-1988

Year	Cash Rent	Ave. Land Value	Ratio of Land Value to Cash Rent
1970	15.58	326	20.9
1971	19.90	332	16.7
1972	19.44	370	19.0
1973	21.54	444	20.6
1974	25.46	521	20.5
1975	27.92	553	19.8
1976	30.80	609	19.8
1977	35.79	778	21.7
1978	37.40	877	23.4
1979	40.00	975	24.4
1980	46.40	1,111	23.9
1981	51.00	1,289	25.3
1982	50.20	1,278	25.5
1983	51.70	1,223	23.7
1984	55.90	1,223	21.9
1985	46.05	1,052	22.8
1986	43.87	936	21.3
1987	41.50	833	20.1
1988	39.20	853	21.8

Sources: Cash Rents: 1970-80 Espel, 1981-88 USDA-ERS
Ave. Value: 1970-80 Espel, 1981-88 USDA-ERS

Espel's land valuation research includes the development of a market model which combines the forces of buyer and seller behavior and incorporates both inflation and taxes. The market model was shown to be both theoretically sound and empirically valid. Espel concludes that 'buyers' maximum bid prices and sellers' minimum ask prices are largely dependent on capitalized cash rents.'

Robison and Burghardt expanded on earlier land valuation research when they developed a number of maximum bid and minimum sell price models both with and without the impact of financing. The Robison and Burghardt models were

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developed consistent with five principles for the construction of present value models. The Robison and Burghardt maximum bid price model with financing considerations is incorporated into the simulation model for the purpose of establishing an average market value per owned acre for updating the firm's end-of-period balance sheet. The maximum bid price model with financing is presented in equation (6.17):

$$(6.17)\qquad ASSETP.L = \frac{WGTGMPA*(1-NTAXRATE)*D2*S5}{K3*K1*(1-K2)*D1}$$

The components and variables contained in (6.17) are derived and defined as follows:

$$(6.18)\qquad \begin{aligned} WGTGMPA = {} & .25*AVEGMPA(1)*(1+RRCR)^{3} \\ & +.25*AVEGMPA(2)*(1+RRCR)^{2} \\ & +.35*AVEGMPA(3)*(1+RRCR) \\ & +.15*AVEGMPA(4) \end{aligned}$$

$$(6.19)\qquad TAXPAP = \frac{TCFE(2)}{AO} * AVEVPA$$

$$(6.20)\qquad R1 = (REIR + INFLA + REIR*INFLA)$$

$$(6.21)\qquad D1 = (R1*(1-NTAXRATE)) - RRCR$$

$$(6.22)\qquad D2 = 1 - \frac{(1+RRCR)^{NOYRS}}{(1 + R1*(1-NTAXRATE)^{NOYRS})}$$

$$(6.23)\qquad D3 = (1 + R1*(1-NTAXRATE))^{NOYRS}$$

$$(6.24)\qquad D3QS = (1+IN.L)^{TERM.L}$$

$$(6.25)\qquad D3Q = (1+R1*(1-NTAXRATE))^{TERM.L}$$

$$(6.26)\qquad D4 = \frac{(D3QS^{-1}) - (D3Q^{-1})}{(1 - D3QS^{-1})}$$

$$(6.27)\qquad D1S = R1*(1-NTAXRATE) - CONCRATE$$

(6.28) K1

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$$(6.28)\quad K1 = \frac{(1+CLOSEFEE)+(TAXPAP*(1-NTAXRATE)*D2}{D1} - \frac{NTAXRATE * (1+CLOSEFEE)}{D3}$$

$$(6.29)\quad K2 = \frac{(1+RRCR)^{NOYRS}*(1-REALFEE)*(1-NTAXRATE)}{K1*D3}$$

$$(6.30)\quad FAC = CASHDP.L + \frac{(1-CASHDP.L)*IN.L}{R1} * \frac{1 - D3Q^{-1}}{1 - D3QS^{-1}} + \frac{(NTAXRATE*(1-CASHDP.L)*IN.L*D4}{D1S}$$

$$(6.31)\quad K3 = FAC + CLOSEFEE - \frac{(NTAXRATE*(1+CLOSEFEE)}{D3}$$

$$(6.32)\quad S5 = \frac{K1*(1-K2) - (TAXPAP*(1-NTAXRATE)*D2}{D1} + \frac{(1+RRCR)^{NOYRS}*(1-REALFEE)*(1-NTAXRATE)}{D3}$$

where

ASSETP.L = Maximum bid price per acre with financial considerations
WGTGMPA = Four year weighted average gross margin per acre
AO = Number of acres owned
AVEVPA = Average value per acre
AVEGMPA(1) = Average gross margin per acre in period t-3
AVEGMPA(2) = Average gross margin per acre in period t-2
AVEGMPA(3) = Average gross margin per acre in period t-1
AVEGMPA(4) = Average gross margin per acre in period t
INFLA = General rate of inflation implicit in the discount rate (GNP Deflator)
IN.L = Nominal long term interest rate

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REIR = Real rate of return available to the firm
RRCR = The expected real growth rate to gross margin per acre
NTAXRATE = Proportional income tax rate paid by the firm
REALFEE = Percentage of asset's value paid as realtor's fees
CLOSEFEE = Percentage of purchase price paid in closing fees
TAXPAP = Property tax rate as a percent of the value of the land
NOYRS = Number of years the asset will be held by the current owner
CASHDP.L = Cash down payment as percentage of purchase price
TCFE(2) = Total real estate taxes paid in period t
TERM.L = Term of real estate loan
CONCRATE = Buyer's nominal interest rate paid on funds used to acquire asset

The following assumptions are made in order to utilize the Robison and Burghardt maximum bid price model in the simulation model:

-A four-year weighted average gross margin per acre (WGTGMPA) is used as the proxy for the firm's net income per acre variable. The four-year moving average variable smooths the year-to-year variation in the gross margin per acre to prevent wide swings in the market value of owned land on the firm's balance sheet. This method approximates the approch used by lenders to adjust asset values for financial reporting and collateral assessment purposes.

-During the model's end-of-year accounting routine, the firm's current period income tax rate (NTAXRATE), is calculated based upon the firm's net income before tax (NIBT) based on other tax related variables provided by the decision maker.

-The GNP price deflator (INFLA), is the proxy for the rate of inflation used in R1.

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-For the real rate of interest (r), the model utilizes a calculated difference between the nominal short term interest rate (IN.C) and the GNP price deflator (INFLA) as follows:

(6.33) REIR = IN.C - INFLA

-The percent of the purchase price paid as closing costs and fees (CLOSEFEE), is asssumed fixed at 2.0 percent.

-The realtor's fee (REALFEE) is assumed fixed at 7.0 percent.

-The expected real growth rate for the average gross margin per acre (RRCR), is assumed to fixed at 2.0 percent per year for the planning period.

-Real Estate taxes per acre (TAXPAP), are expressed as a percent of the market value of the land. The real estate tax paid as a percent of market value is calculated based on the property taxes paid by cash grain farms on MSU's Telfarm accounting system. Real estate taxes paid by the Telfarm cash grain farms for 1986 (the last year that summary data is available), as a percent of the farm's total real estate value (on a per acre basis), averaged 4.0 percent for those farms with 800 acres or less and 5.0 percent for those farms with more than 800 acres. The model uses equation (6.19) to calculate TAXPAP. As a result of this analysis, if the calculated percentage is less than 4.0 percent, 4.0 percent is used in the model for that period.

-The number of years that the owner plans to own the real estate (NOYRS), is assumed to be 25 years and is held constant over the planning period.

-The mortgage interest rate available to the 'future' buyer of the real estate (CONCRATE), is assumed to be equal to the rate paid by the current owner (IN.L).

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6.4.3 Valuation of Rented Tillable Acreage

In order to calculate several investment ratios required during the optimization routine, including the ratio of investment in farm machinery to total land value (owned and rented), a market value must be assigned to rented crop acreage. The maximum bid price model with financing is used for estaimating the market value of rental acreage when the decision maker owns real estate. In the case where the decision maker does not own real estate, the model uses a version of the capitalization model presented in equation (6.16).

As discussed in section 6.4.2, the capitalization model requires only two variables: the average cash rent per acre and the investor's desired rate of return. The average cash rent paid by the firm is used as the proxy for the average gross margin per acre AVEGMPA, and the investor's desired real rate of return is fixed at 5.0 percent. The model calculates the value of rented land (if rental acreage is available) early during the planning process so that the rental acreage value can be utilized during the model's optimization process.

The model updates the value of rental acreage at the end of the production cycle in one of two ways. If the firm owns real estate, the market value of rental acreage is set equal to the market value of owned acreage as calculated with the Robison and Burghardt maximum bid price model. In the case where the firm does not own real estate, the market

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value per acre of the rental acreage is estimated by multiplying the rental rate per acre in the current period (RRPA), by one plus the expected real growth rate for the gross margin per acre (RRCR). The result of this first calculation is then multiplied by a cash rent-to-land value ratio of 20.0. The estimated total market value of the rental acreage is calculated by multipling the value per acre by the number of acres the firm rented this period. Equations (6.34) and (6.35) summarize these calculations:

$$PPRA = RRPA*(1+RRCR)*20.0 \quad (6.34)$$

and

$$ASSET.PLR = PPRA*AR \quad (6.35)$$

where

ASSET.PLR = Total market value of rental acreage
AR = Number of rental acres
PPRA = Market value per rental acre

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6.4.4 Availability of Additional Tillable Acreage

The model provides the user with complete flexibility during the initial deterministic data input routine to enter the expected number of tillable acres available to expand the farm operation. The decision maker has the opportunity to identify the number of tillable acres available for both purchase and cash rental during the next planning cycle. If additional acreage for either purchase or cash rental, or both, is not available, the user has the flexibility to identify the resource limitation. In addition to the number of acres available for purchase and rental the user is prompted to enter the respective purchase price and cash rental rate per acre. The minimum parcel size that will be considered for both purchase and cash rental is half an acre.

The model does not provide for differentiation of yield per acre between either owned or rental acreage or between parcels of owned or rental acreage. As a result, the decision maker is required to calculate the expected average yield for the total acreage planted in each crop for the next production cycle.

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6.5 Macro Economic Data

6.5.1 General Rate of Inflation

It is beyond the scope of this simulation model to attempt to estimate the required macro economic parameters, such as the general rate of inflation and selected interest rates. Instead, the computer model relies on exogeneously generated macro economic parameters. The general rate of inflation data for the 1988-1997 planning horizon is inputted for the user during the initialization of the model. The GNP implicit price deflator (GNP Deflator) is utilized in the model as the general rate of inflation. Historically, the annual rate of change in the GNP Deflator closely reflects the annual rate of change in the various price indexes for crop production inputs and field equipment. Therefore, the GNP Deflator was selected over the CPI price index, used as a general parameter for rate of inflation.

Previous research studies involving the modeling of agricultural firms have selected different indexes of inflation as the most appropriate proxy to use as both the baseline inflation rate and to serve as the basis for the expected rate of inflation over time. For example, Skees and Pederson use the CPI price index and hold the expected rate of inflation fixed over the planning horizon. Leatham selects the GNP Deflator and estimates subsequent inflation rates based on a normal distribution of changes in the historical GNP deflator data series.

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The GNP Deflator is used in this model as the most appropriate proxy for the expected inflation rate to adjust the firm's baseline enterprise crop budgets and required replacement field machinery purchases during the multi-year planning period. This model provides for specifying a different inflation rate each planning period if desired. Table 6-7 highlights the expected rate of inflation for the 1988-1997 planning period.

Table 6-7 GNP Deflator: 1988-1997

Year	GNP Price Deflator
1988	3.1
1989	4.2
1990	4.7
1991	4.4
1992	4.4
1993	4.5
1994	4.5
1995	4.6
1996	4.6
1997	4.6

Source: WEFA Group, U.S. Long Term Economic Outlook: 1988-97

6.5.2 Introduction: Agricultural Lenders, Availability of Loan Funds and Interest Rate Policies

A combination of factors, including the continued deinsulation of agricultural credit from forces in the U.S. financial markets, due in large part to the deregulation of the banking industry, and the monetary policy changes of the Federal Reserve Bank in 1979, have resulted in higher and

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more volatile interest rates for farmers. It is expected that farm credit conditions in the future will more closely follow trends in the national financial markets than ever before.

Historically, farmers who borrowed from the Farm Credit System had access to adequate funds at rates only slightly higher than U.S. government rates. Farm Credit's fund availability and interest rates were both more reliable and more stable than available funds and interest rates offered by many other agricultural lenders, especially commercial banks. In recent years, the interest rate spread between Farm Credit bonds and U.S. Treasury bonds has widened, increasing from only several basis points in the early 1980s to the current 30 to 60 basis point range depending on the bonds maturity date. The interest rate offered by Farm Credit for loan short term and real estate loans to farmers has remained relatively competitive, despite the fact that Farm Credit's rates tend to lag behind market rates, and on occasion may increase while market rates are declining, and the well publicized organizational and equity capital problems that have confronted the cooperative lending System.

Agricultural banks in general have maintained adequate credit availability for qualified borrowers, but at interest rates that more closely follow market rates. Commercial banks especially those in rural areas, have grown increasingly dependent on rate sensitive sources of funds, reflect-

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ing the effects of financial deregulation. As a result, the majority of commerical banks have adopted floating or variable interest rate programs so that changes in the banks' cost of funds can be more quickly passed along to their borrowers.

Even the U.S. government's Farmers Home Administration agricultural loan programs, which for years offered qualified farmers significantly subsidized interest rates, now lend money at interest rates that more closely reflect the government's actual cost of funds. In addition, the Farmers Home Administration has in recent years moved away from direct lending to farmers and has developed loan programs that rely on loan guarantees, with loan funds being advanced and administered by other agricultural creditors such as commercial banks and the Farm Credit System.

The computer simulation model provides for three classes of liabilities, including: operating (current), intermediate and long term (real estate) debt, and permits the user the flexibility to enter the most appropriate interest rate along with the other lender credit policy variables for each class of debt. The model does not provide for a level of financial accounting detail that would allow the user to identify multiple sources of credit or multiple sets of credit policy variables within a class of debt. In the event there may be several creditors for one or more of the debt classifications, the user should calculate a weighted average interest rate for the debt category during

the data input routine. This same weighted average approach is recommended for inputting the appropriate term of loan, maximum leverage ratio, liquidity premium and percent of cash down payment required. These and other credit policy variables are discussed in more detail in Chapter 5, section 5.5.2.

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6.5.3 Discussion of Selected Interest Rates

As with the rate of inflation, estimation of future interest rates is beyond the scope of this research project. However, the nominal rate of interest for each class of debt and the relationship between the nominal interest rate and the calculated real interest rate are important factors in the model. A proxy for the real interest rate is a required input for the maximum bid model equation used for updating the value of the firm's owned tillable acreage. In addition, any surplus cash held above that level required to meet the operational demands of the firm is assumed to earn a risk free rate of return equal to the yield on 90-Day U.S. Treasury Bills (T bills).

Table 6-8 Nominal and Calculated Real Interest Rates Based on the 90 Day T-Bill: 1975-1997

Year	Nominal Rate	GNP Price Deflator	Real Rate
1975	5.8	9.3	-3.2
1976	5.0	5.2	-0.2
1977	5.3	5.8	-0.5
1978	7.2	7.4	-0.2
1979	10.0	8.6	1.4
1980	11.5	9.3	2.2
1981	14.1	9.4	4.7
1982	11.5	6.0	5.5
1983	8.6	3.8	4.8
1984	9.6	3.8	5.8
1985	7.5	3.2	4.3
1986	6.0	2.6	3.4
1987	5.8	3.0	2.8

Source: WEFA Group, U.S. Long Term Economic Outlook: 1988-97

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Table 6-8 highlights the relationship between the 90 Day T-Bill interest rate, GNP implicit price deflator (GNP Deflator), and the calculated real rate of interest for the historical period 1975-1987. The calculated real interest rate averaged 2.57 percent over the 13 year historical period.

Table 6-9 presents both the projected 90 Day T-Bill interest rates and the projected GNP Deflator for the 1988-1997 planning horizon along with the calculated real interest rate for the period. The projected real interest rate averages 2.57 percent, .2 percent higher than the historical average real rate.

Table 6-9 Projected Nominal and Calculated Real Interest Rates Based on the 90 Day Treasury Bill Rate: 1988-1997

Year	Nominal Rate	GNP Price Deflator	Real Rate[a]
1988	7.0[b]	3.1	3.9
1989	7.5	4.2	3.3
1990	6.7	4.7	2.0
1991	6.3	4.4	1.9
1992	6.4	4.4	2.0
1993	6.5	4.5	2.0
1994	6.6	4.5	2.1
1995	6.7	4.6	2.1
1996	6.8	4.6	2.2
1997	6.8	4.6	2.2

a) Real Rate = Nominal Rate - GNP Price Deflator
b) Nominal rate increased 80 basis points for actual 1988 year-to-date rate

Source: WEFA Group, U.S. Long Term Economic Outlook: 1988-97

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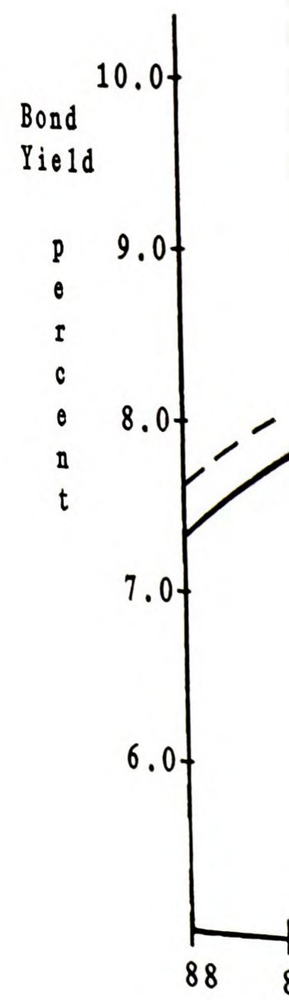

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Source:

The projected interest rates for the period 1988-97 are based on three primary factors, including: continuation of the normal interest rate yield curve which exists in the U.S. capital markets, continuation of both the historically high correlation and the narrow rate spread between U.S. Treasury bond yields and the yield on Farm Credit bonds. Figure 6-2 highlights the current relationship between U.S. Treasury and Farm Credit bond yields and the narrow rate spread for the period 1988-1997.

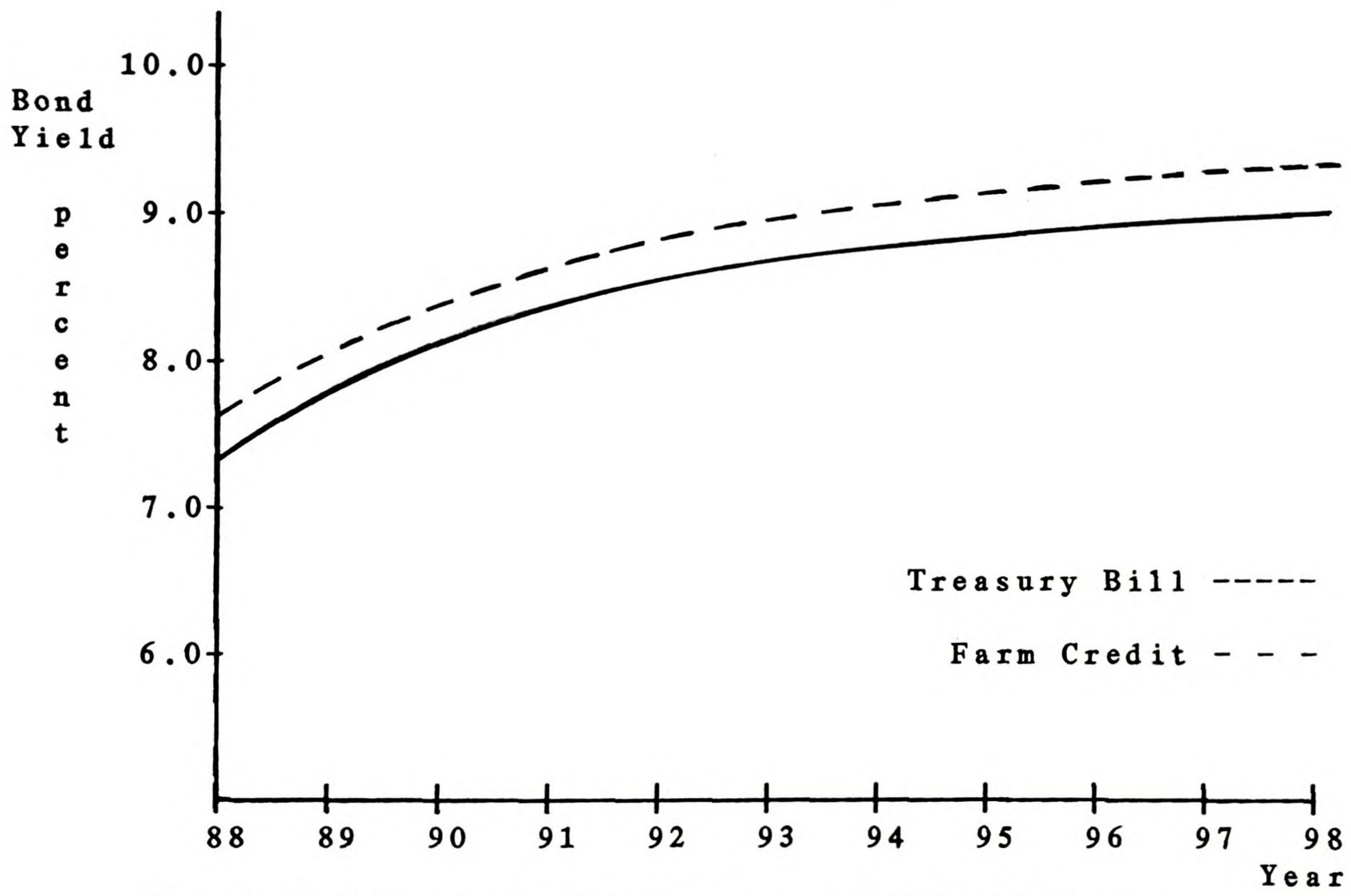

Figure 6-2 Farm Credit System and U.S. Treasury Bond Yield Curves for the Period 1988-97

Source: Wall Street Journal, September 16, 1988

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6.5.4 Nominal Interest Rates For the Model

The nominal interest rates used in the model for the simulation analysis presented in Chapter 7 are highlighted in Table 6-10.

Table 6-10 Projected Nominal Interest Rates for the Three Debt Classes for the Model Simulation Analsyis: 1988-1997

Year	Operating Loan	Machinery Loan	Real Estate Loan
	- - - - - - - - percent - - - - - - - -		
1988	9.25	9.85	10.75
1989	9.75	10.35	11.25
1990	8.95	9.55	10.45
1991	8.55	9.15	10.05
1992	8.65	9.25	10.15
1993	8.75	9.35	10.25
1994	8.85	9.45	10.35
1995	8.95	9.55	10.45
1996	9.05	9.65	10.55
1997	9.05	9.65	10.55

The nominal interest rates presented in Table 6-10 for operating and machinery loans are based on three primary factors: the projected 90-day U.S. Treasury bill rates presented in Table 6-9, the Federal Intermediate Credit Bank of St. Paul (FICB) and Production Credit Association (PCA) cost-of-funds, and an interest rate differential for the longer term machinery loans relative to operating loans.

While Farm Credit usually charges its borrowers the same interest rate for operating and machinery loans, commerical banks typically charge borrowers of longer term

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machinery loans an additional 50 to 80 basis points above the interest rate they charge for one-year operating loans.

The operating loan interest rates presented in Table 6-10 are based on two factors: the projected 90-day U.S. Treasury bill rate plus a 225 basis point rate adjustment. Of the total 225 basis points, 15 basis points represent a cost-of-funds adjustment for the yield differential between 90- and 180-day U.S. Treasury bill rates. The 180-day maturity currently reflects the St. Paul FICB's average bond maturity in its bond portfolio. The remaining 210 basis points represent a cost-of-operations rate spread as follows: 70 basis points added to the base cost of funds charged the FICB of St. Paul, 40 basis points for the St. Paul FICB's cost of operations, and 100 basis points for the local PCA association's cost of operations. The local PCA association is responsible for lending the funds to the farm firm.

The interest rate charged for machinery loans is based on the nominal interest rate charged for operating loans plus 60 basis points. The additional 60 basis points reflect a proxy for the average interest rate differential charged by commercial banks for machinery loans, which typically have four- to seven-year amortization periods.

The real estate loan interest rates presented in Table 6-10 are based on three primary factors: the 90-day Treasury bill rates presented in Table 6-9, a yield differential between 90-day and one-year U.S. Treasury bill yields, and a

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325 basis point rate spread which reflects the average rate spread for the three tiered interest rate structure offered through the Federal Land Bank of St. Paul's Land Master Loan Program.

The Land Master program permits the borrower to select between one-year, three-year, or five-year fixed interest rate options. The interest rate offered borrowers through the Land Master Program ranges between 200 and 225 basis points above the yield on one year U.S. Treasury bonds. The interest rate charged farmers participating in the Land Master Program is adjusted at the end of the time period to reflect the Federal Land Bank's cost of funds for next time period.

A final note concerning the nominal interest rates used in the model. The farm scenarios presented in Chapter 7 assume that the farm firms are not borrowing from Farm Credit. Use of Farm Credit's base interest rate structure was selected for use in the model because historically there has been, and continues to be, a high correlation between Farm Credit System bond yields and the yield on 90-day U.S. Treasury bills. As a result, the interest rates used in the model for simulation purposes are based on the exogeneously generated 90-day U.S Treasury bill rates, estimated yield curve adjustments, cost-of-operations rate spreads for two programs offered by Farm Credit, and an interest rate adjustment charged by most commercial banks for longer term machinery loans.

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While in practice farmers are required to purchase equity stock in the borrower-owned Farm Credit System in order to borrow funds, the nominal interest rates presented in Table 6-10 do not include a cost-of-funds adjustment for the cost of purchasing Farm Credit stock. By not including the cost of stock, the interest rates in Table 6-10 are comparable to interest rates currently available from agricultural lenders in general, including commercial banks, Farm Credit, and other lenders. To simulate borrowing activity from Farm Credit, the nominal interest rates presented in Table 6-10 should be increased by an average of 50 to 150 basis points to reflect the cost of purchasing Farm Credit stock.

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CHAPTER 7

REVIEW AND ANALYSIS OF SIMULATION MODEL RESULTS

7.1 Introduction

The simulation model in this study is designed to operationalize the credit reserve theory of the firm presented in chapters 3 and 4 and to integrate production, marketing and investment strategies to provide a format for communicating the intricacies of risk management decision making. The simulation model is thus an analytical tool which provides the means for evaluating the economic impact of alternative credit policies, production and pricing strategies, consumption behavior, and other key variables on the decision maker's wealth position. Conducting simulation analysis on a typical medium-equity corn/soybean farm under various macro economic, lender credit policies, and production and price strategies is intended to identify the relative impact of each of these factors on the end-of-period wealth position of the decision maker.

This chapter presents the results of six alternative scenarios generated with the simulation model, including:

1. Restricted Base Run Model (RBRM)- Operation of the model over a five-year planning period without the purchase or sale of either machinery or land from the firm's initial resource endowment. Further,

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2. Base Run Model (BRM)- Selection of the model's recommended optimal debt position, together with use of All-Risk Crop Insurance and forward contracting of commodities.

3. Base Run Model with Increasing Collateral Requirements (BRM-ICR)- Collateral Requirements are increased 100 percent from the BRM model.

4. Base Run Model with Increasing Nominal Interest Rates (BRM-INIR)- Nominal interest rates are increased 50 percent over the five year period.

5. Base Run Model with Incentive Interest Rate Program (BRM-IRP)- The incentive interest program consists of several components including shortened amortization periods for intermediate and long term loans, increased cash down payment requirements for machinery and real estate investments, in return for lower nominal interest rates on intermediate and long term debt.

6. Base Run Model with Increased Price and Yield Risk (BRM-IPYR)- Price and yield risk increased 50 percent over the five-year period.

The Restricted Base Run Model (RBRM) is presented first to discuss the firm's initial financial endowment in detail, and to discuss in more detail the operation of the model. The initial financial position presented with the Restricted Base Run Model will also serve as the initial financial position in each of the scenarios presented in this chapter.

Finally, the chapter's summary section will compare results and present key performanace measures, including a measure of return to the firm's net worth -- a five-year Internal Rate of Return (IRR) for the six scenarios.

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7.2 Restricted Base Run Model

7.2.1 Data Assumptions, Lender Credit Variables and Deterministic Parameters for the Firm

The initial financial position for Paul and Mary Dalton, a fictitious farm family that will be used throughout this chapter, is presented in Table 7-1. The firm's initial debt-to-equity ratio is .64:1, considered a medium equity position. The firm's initial debt mix includes 22 percent of the firm's total debt in current liabilities (one-year term), 23.0 percent in intermediate term debt (five year term), and 54 percent long term or real estate debt.

The firm's initial real estate endowment consists of 600 owned acres and an additional 600 cash rented acres. All 1,200 acres are assumed to be tillable, with 60 percent planted to soybeans and 40 percent planted to corn. The firm is required to prepay 50 percent of the annual cash rent on January 1st. The balance of the lease payment is accounted for as a current liability-lease payable, with payment scheduled for December 31. The cash required for the initial 50 percent of the annual lease payment is obtained through an advance on the firm's operating line of credit.

In addition, on January 1st, the firm must purchase the required replacement machinery necessary to maintain the firm's productive capability at the same level as the pre-

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NET WORTH

Table 7-1 Paul and Mary Dalton

INITIAL BALANCE SHEET: 12-31-87

ASSETS		MODIFIED COST	MARKET VALUE
CURRENT ASSETS			
- Cash/Cash Equivalent		$88,244	$88,244
- Prepaid Land Lease		24,000	24,000
TOTAL CURRENT ASSETS		$112,244	$112,244
INTERMEDIATE ASSETS			
- Machinery and Bldg.			
- Cost Basis	$335,910		$303,780
- Acc. Dep.	42,792		
- Book Value	-------	293,118	
TOTAL INTERMEDIATE ASSETS		$293,118	$303,780
REAL ESTATE			
- Acres= 600		$240,000	$540,000
		--------	--------
TOTAL VALUE OWNED ASSETS		$645,362	$956,024
VALUE OF RENTED LAND		N/A	$540,000
- Acres= 600			
VALUE OF RENTED and OWNED LAND		$645,362	$1,496,024
LIABILITIES AND NET WORTH			
CURRENT LIABILITIES			
- Operating Loan (12 mo or less)		$37,000	$37,000
- Current Port. Inter. Debt		25,405	25,405
- Current Port. Long Term Debt		7,500	7,500
- Land Lease Payable		12,000	12,000
TOTAL CURRENT LIABILITIES		$81,905	$81,905
INTERMEDIATE LIABILITIES			
- Machinery/Bldg. loan		$101,619	$101,619
- Contingent Tax on Inter. Assets		N/A	1,599
TOTAL INTERMEDIATE LIABILITIES		$101,619	$101,619
LONG TERM LIABILITIES			
- Real Estate Mortgage		$142,500	$142,500
- Contingent Tax on Land		N/A	45,000
TOTAL LONG TERM LIABILITIES		$128,000	$143,000
TOTAL LIABILITIES		$326,024	$372,623
		--------	--------
NET WORTH		$319,338	$583,401

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Table 7-2

CREDIT POLI VARIABLE
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vious year. For the Restricted Base Run Model (RBRM), the required machinery investment on January 1, 1988 was 33,780 dollars. Details of the required machinery purchase, including the calculation methodology, is presented in chapter 5, section 5.7.2.

The lender's initial credit policy variables and interest rates are presented in Table 7-2.

Table 7-2 Summary of the Lender's Credit Policy Variables

CREDIT POLICY VARIABLE	LENDER		
	CURRENT	INTERMEDIATE	LONG TERM
Liquidity Premium (ρ) . . .	.05	.15	.20
Credit Policy Variable (δ) . .	.75	.50	.50
Interest Rate . .	9.25%	9.85%	10.75%
Cash Down Payment Percentage . . .	5.00%	20.00%	20.00%
Amortization Term (No. of Years)	1.0	5.0	20.0
Minimum Credit Reserve Balance (in dollars) . .	1,000	1,000	1,000

Based on the credit policy variables in Table 7-2 and the firm's beginning-of-period financial position, the firm's initial restricted and maximum credit reserves and two measures of cash flow exposure are presented in Table 7-3.

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Table 7-3 Credit Reserve Summary Information

Cash Flow Exposure Measures

MAXER.W: 288,731 MAXEM.W: 396,078

Credit Reserves

Debt Category	Restricted	Maximum
Current	251,409	1,152,638
Intermediate .	373,785	863,931
Long Term . . .	630,000	1,185,000
Weighted . . .	942,694	2,422,070

The cash flow measure MAXER.W represents the maximum deficit cash flow the firm can experience before exhausting its restricted credit reserves, while the MAXEM.W represents the maximum deficit cash flow the firm can experience before the firm is forced to go bankrupt.

7.2.2 Year One-Financial Position and Cash Flow Performance

Model I, the RBRM scenario, assumes that the firm does not utilize either All-Risk Crop Insurance or forward contracting of commodities as a means to manage production and price risk. Further, the RBRM scenario assumes that the decision maker ignores the model's recommended optimal debt solution and instead proceeds to operate the next production cycle based on the firm's beginning-of-period debt position

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and the firm's beginning-of-period ratio of machinery to total value of land.

The firm's initial machinery to land ratio (GAMMA) is .281, which is based on a machinery investment of 303,780 dollars and 1,200 acres of owned and rental acreage with an average market value of 900 dollars per acre (1,080,000 dollars total market value).

For year one of the five-year simulation, the model recommended an optimal debt position for the firm of 385,400 dollars. This optimal debt level represents an increase of 59,377 dollars from the firm's initial total debt position of 372,623 dollars. Based on the macro economic variables and firm-specific parameters for year one, the model recommended the purchase of an additional 74,221 dollars of machinery, while maintaining the firm's real estate position of 1,200 acres. Purchase of machinery requires a 20 percent cash equity investment for each dollar of machinery purchased. Therefore, the firm would utilize 14,844 dollars of available cash if the computer's optimal debt recommendation were to be selected, together with 59,377 dollars of the firm's available intermediate debt credit reserve. Selection of the recommended optimal debt position would have increased the firm's machinery-to-land ratio (GAMMA) to 35.0 percent from the initial ratio of 28.1 percent. The recommended 35.0 percent GAMMA ratio represents the machinery-to-land ratio which, based on the initial set of input variables, would maximize the decision maker's end-of-period

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wealth position. In arriving at the 35.0 percent GAMMA recommendation, the model evaluated machinery-to-land ratios between 15.0 and 40.0 percent, in increments of 2.5 percent.

During the planning phase, the model's optimal debt recommendation was based on randomly generated prices of 2.81 per bushel for corn and 9.35 per bushel for soybeans. The model generated random yields of 161 and 55 bushels respectively for corn and soybeans during the financial planning phase of the analysis for 1988.

The model selected an optimal GAMMA ratio of 35.0 percent which combined with the random commodity prices and yields generated an expected rate of return to total assets (RBAR) of 24.88 percent during the planning phase.

7.2.3 Year End Net Worth Position and Measures of Performance

After the financial planning phase is completed, the model generates a balance sheet dated January 1, 1988 which reflects the decision maker's financial decisions and updated credit reserves. Having completed the planning phase the model proceeds to simulate commodity prices and yields for the year and calculates the firm's net cash flow and RBAR. For 1988, year one of the five-year simulation, the model generated a stochastic corn price of 2.36 dollars per bushel and a yield of 108 bushels. This corn price is 28 cents below the Michigan expected corn price for 1988 and 45 cents below the random corn price generated during the planning phase. The 108 bushel corn yield is 12 bushels

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below the firm's five-year historical trend yield and 53 bushels less than the random yield used for planning purposes.

For soybeans, the model generated a stochastic price of 8.77 dollars per bushel, and a random yield of 32 bushels. This represents a soybean price 98 cents below the expected 1988 Michigan soybean price but only 58 cents below the planning price. The soybean yield was 8 bushels below the firm's five year trend yield of 40 bushels and 23 bushels less than the planning yield.

Based on the firm's simulated cash flow for 1988, the firm realized 44,911 dollars in net before-tax income from farm operations, which together with 20,000 dollars in non-farm income less 20,473 dollars in federal, state and social security taxes resulted in a net after-tax income of 44,438 dollars. Based on the firm's total cash commitments the firm realized a net cash flow of 17,077 dollars for 1988. Table 7-4 presents a summary of the firm's sources and uses of cash for 1988.

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Table 7-4 Cash Flow Summary for 1988

Paul and Mary Dalton	Year: 1988
SOURCES OF CASH:	
Cash Receipts: Operations	322,522
Other Farm Income	697
Capital Asset Sales	0
Non-Farm Income	20,000
New Intermediate and Long Term Debt	27,023
TOTAL CASH AVAILABLE:	370,242
USES OF CASH:	
Total Cash Operating Expenses . . .	213,666
Capital Asset Purchases	33,779
Intermed. and Long Term P+I Pmts. .	61,541
Taxes and Social Security	20,473
Family Living Withdrawal	18,706
Non-Farm Cash Withdrawal	5,000
Asset Liquidation Expenses	0
TOTAL CASH REQUIRED:	353,165
NET CASH FLOW (DEFICIT):	17,077
FORCED ASSET LIQUIDATION:	0

After calculation of the firm's net cash flow the firm's end-of-period balance sheet is updated to reflect both the firm's net cash flow performance for the year, scheduled amortization of debt and any change in the market value of owned and rented real estate.

As presented in detail in chapter 6, section 6.4, the Robison and Burghardt maximum bid price model for land valuation with financing considerations is used at the end of each production period to revalue both owned and rented

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acreage. The firm's real estate values are adjusted to reflect changes in macro economic variables along with changes to firm-specific variables such as realized yields, prices and net income per acre. The adjusted real estate values are then incorporated into the firm's end-of-period balance sheet. Further, the revised real estate value per acre is used to establish the rental rate per acre for the next production cycle.

For 1988, the firm's owned real estate increased in value a total of 93,983 dollars, representing a 17.44 percent increase from 1987. The average value per acre increased 157 dollars, bringing the average value per acre to 1,057 dollars.

The 93,983 dollar increase in the value of the firm's real estate combined with the 28.0 percent marginal tax rate for the period resulted in a 65,315 dollar increase in the firm's contingent tax account for real estate appreciation.

The firm's simulated 1988 rate of return to total assets (ROTA) was 9.91 percent, 60.2 percent below the 24.88 percent rate of return to total assets the model generated for the optimal debt recommendation used during the planning phase. The large variance between the planning ROTA and the end-of-period ROTA is attributed to the fact that during the planning phase the model generates 30 sets of random prices and yields which are used to calculate the firm's planning RBAR, or average rate of return to total assets. As a result of the large number sample size (n=30) price and yield

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variability is minimized. During the simulation of the firm's end-of-period cash flow the model generates one price and yield (n=1) for each commodity. These prices and yields are then used to calculate the firm's rate of return to total assets, RBAR for the year. The end-of-period stochastic commodity prices and yields are responsible for the wide variance between the planning and end-of-period ROTA.

As a result of 1988's favorable net cash flow outcome, the firm's liquidity position as measured by the current ratio (the ratio of current assets to current liabilities) improved from 1.56:1 as of December 31, 1987 to 2.21:1 on December 31, 1988. Despite the fact that the firm's total contingent tax liability increased 66,701 dollars during 1988, the firm's equity percentage increased one percent to 60 percent.

Paul and Mary Dalton's 624,024 dollar end-of-period wealth (net worth) position reflected an increase of 40,623 dollars for the preceeding 12-month period. For 1988 the Daltons realized a 6.96 percent after-tax internal rate of return (IRR) on their equity capital.

7.2.4 Summary of Financial Performance: 1989-1992

Table 7-5 presents the firm's cash flow performance under the RBRM model assumptions for the period 1988-1992. The firm realized a deficit cash flow in 1990-1992, with the five-year total net cash flow of (40,989) dollars. The five-year average annual net cash flow was (8,198) dollars with a

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Beginning Cash	$ 322,552	$ 538,902	$ 270,580	$ 218,512	$ 196,894

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Cash Receipts From Oper.	$ 322,552	$ 538,902	$ 270,580	$ 218,512	$ 196,894
Other Farm Income	697	1,245	8,840	8,139	3,652
Capital Asset Sales	0	0	0	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	27,023	27,857	27,821	27,589	27,429
TOTAL CASH AVAILABLE:	$ 370,274	$ 589,004	$ 329,292	$ 277,391	$ 251,624
USES OF CASH					
Total Cash Oper. Expenses	$ 213,666	$ 216,124	$ 226,899	$ 254,880	$ 275,176
Capital Asset Purchase	33,779	34,821	34,776	34,486	34,287
Intermed. and LT P&I Pmts	61,541	62,452	59,744	58,040	57,587
Taxes & Social Security	20,473	92,134	0	0	0
Family Living Withdrawal	18,706	20,000	8,000	8,000	8,000
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	0	0	0	0	0
TOTAL CASH REQUIRED:	$ 353,166	$ 430,531	$ 334,420	$ 360,407	$ 380,050
NET CASH FLOW (DEFICIT):	$ 17,108	$ 158,473	$ (5,128)	$ (83,016)	$(128,426)
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 318,509	$ 501,927	$ 721,051	$ 554,683	$ 263,912
Result in Bankruptcy	$ 428,669	$ 651,738	$ 900,936	$ 697,162	$ 371,685

Table 7-5 Restricted Base Run Model-Cash Flow Summary: 1988-1992

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standard deviation of 110,093 dollars. Based on the average net cash flow and variance, the coefficient of variation is 13.43.

The firm's capital purchases are limited to machinery purchases required to maintain the firm's productive capability. As expected, family consumption is correlated to the firm's cash flow experience, peaking at 20,000 dollars in 1989 and triggering the 8,000 dollar minimum consumption in 1990-1992 respectively.

The firm paid federal, state and social security taxes in 1988 and 1989 in response to the positive net income before-tax positions, but paid no taxes for the period 1990-1992. During the five-year period the firm did not have to liquidate assets as a means to balance its net cash flow position. However, in 1992 the firm balanced its (128,426 dollars) deficit cash flow by refinancing the 128,426 dollar deficit with real estate debt.

Table 7-6 presents a summary of the firm's end-of-year balance sheet, restricted credit reserves, the machinery-to-land ratio (GAMMA) and selected financial statistics for the period 1987-1992. In particular, Table 7-6 highlights the fact that over the five-year period, the decision mkaer's net worth position declined 34,918 dollars from 583,401 dollars on December 31, 1987 to 548,483 dollars on December 31, 1992. Over the 1987-1992 period, the value per acre for the firm's owned real estate realized a net increase in value of 25,070 dollars (4.6 percent).

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
ASSETS						
			[illegible]	$ 227,921	$ 137,985	$ 139,762

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
ASSETS						
Current Assets	$ 119,000	$ 96,798	$ 240,028	$ 227,921	$ 137,985	$ 139,762
Machinery	270,000	267,109	265,490	264,035	262,509	260,999
Real Estate	540,000	633,983	790,581	1,086,223	882,028	565,070
Total Owned Assets	$ 929,000	$ 997,983	$1,296,099	$1,578,179	$1,282,522	$ 965,831
Value Rental Acreage	540,000	633,983	790,581	1,086,233	882,028	565,070
Total Owned & Rented Assets	$1,469,000	$1,631,873	$2,086,680	$2,664,401	$2,164,551	$1,530,900
LIABILITIES and NET WORTH						
Current Liabilities	$ 76,500	$ 43,895	$ 35,708	$ 35,678	$ 35,566	$ 34,381
Intermediate Liabilities	81,599	84,280	85,850	85,697	86,535	87,103
Long Term Liabilities	187,500	245,690	282,769	249,109	212,371	295,863
Total Liabilities	$ 345,599	$ 373,866	$ 404,327	$ 370,484	$ 334,472	$ 417,348
Net Worth	$ 583,401	$ 624,024	$ 891,772	$1,207,695	$ 948,051	$ 548,483
Machinery to Land Ratio	25.00%	21.10%	16.80%	12.20%	14.90%	23.10%
Change in Real Estate Value	NA	$ 93,983	$ 156,598	$ 295,652	$ (204,205)	$ (316,958)
Change in Total Debt	NA	$ 28,267	$ 30,461	$ (33,843)	$ (36,012)	$ 82,876
Change in Net Worth	NA	$ 40,623	$ 267,748	$ 315,923	$ (259,644)	$ (399,568)
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 304,297	$1,092,850	$1,035,340	$ 608,147	$ 663,868
Intermediate	373,785	359,143	355,162	345,134	336,795	329,796
Long Term	630,000	840,466	1,175,038	1,786,627	1,397,529	349,814
Weighted	$ 942,694	$1,011,003	$1,675,594	$2,345,803	$1,815,698	$ 901,495

Table 7-6 Restricted Base Run Model-Year End Balance Sheet: 1987-1992

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992
FINANCIAL					
	$ 269.38	$ 450.16	$ 232.85	$ 188.88	$ 166.58
					279.25

Operations and Financial Summary Report: 1988-1992					
Category	1988	1989	1990	1991	1992
FINANCIAL					
Value of Farm Production/Acre	$ 269.38	$ 450.16	$ 232.85	$ 188.88	$ 166.58
Cost of Production/Acre. . . .	231.95	234.47	240.99	262.77	279.25
Net Income After Tax/Acre. . .	$ 37.43	$ 215.69	$ (8.14)	$ (73.89)	$(112.67)
Real Estate Value Per Acre . .	$1,057	$1,318	$1,810	$1,470	$ 942
After Tax Return-Total Assets	9.61%	27.52%	2.69%	(2.49)%	(7.05)%
IRR on Net Worth-Year to Year	6.96%	42.91%	35.43%	(21.50)%	(42.15)%
IRR on Net Worth-Annualized	6.96%	23.64%	27.45%	12.91%	(1.23)%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	128	126	122
- Planning Yield (bu) .	161	180	72	74	155
- Actual Yield (bu) . .	108	140	103	77	81
- Planning Price. . . .	$2.64	$2.72	$2.78	$2.33	$2.78
- Actual Price	$2.36	$2.92	$2.95	$2.54	$2.70
Soybeans- Trend Yield (bu) . .	41	42	42	40	34
- Planning Yield (bu) .	55	48	26	23	32
- Actual Yield (bu) . .	32	46	19	21	15
- Planning Price. . . .	$9.01	$9.24	$8.45	$7.62	$9.05
- Actual Price	$8.77	$10.29	$8.96	$8.32	$8.40
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	600	600	600	600	600
Corn Acreage	480	480	480	480	480
Soybean Acreage	720	720	720	720	720

Table 7-7 Restricted Base Run Model-Operations and Financial Report: 1988-1992

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With regard to the machinery-to-land ratio (GAMMA), the firm's initial ratio of 25.0 percent declined by 51.1 percent to 12.2 percent in 1990 as a result of two factors -- first, not having the option to purchase additional machinery above that required to maintain the firm's productive capacity, and second, increased value of real estate per acre through 1990. Subsequently as the firm's net income per acre declined from 215.69 dollars per acre in 1989 to a deficit of (112.67) dollars per acre in 1992, the value of the firm's real estate declined accordingly. From 1,810 dollars per acre in 1990 owned land declined to 942 dollars per acre by December 31, 1992. Requiring the firm to maintain its investment in machinery while real estate values declined 48 percent per acre resulted in increasing the GAMMA ratio to 23.1 percent as of December 31, 1992.

Table 7-7 presents selected financial performance measures, crop prices and yields, crop mix and acreage totals for the 1988-1992 period. The variability in the value of farm production per acre and net after-tax income per acre illustrates the production and price risk the firm encountered as a result of not utilizing risk management strategies. If All-Risk Crop Insurance had been purchased at the 78 and 26 bushel guaranteed yield levels for corn and soybeans, respectively, as was the assumption in the Base Run Model, the firm would have received insurance payments in 1990, 1991 and 1992 to offset the reduced value of farm production per acre. With regard to the cost of production

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per acre, production costs increased each of the five years as a result of price inflation. Production input price inflation exceeded any economy of scale benefits the firm realized based on the number of acres planted each year.

As a result of the significant deficit net after-tax income per acre in 1991 and 1992, the value of the firm's real estate declined a total of 521,163 dollars over that two-year period. This loss of capital gain to the firm's real estate represented a decline of 869 dollars per acre during the period.

7.2.5 Summary of the RBRM Model Performance

Over the five-year period the firm experienced significant variability in net cash flow, real estate valuation and return on owners equity (wealth). Table 7-7 presents two measures of the rate of return to the firm's net worth -- a year-to-year Internal Rate of Return (IRR), and a 1988 to current year annualized IRR. The year-to-year IRR clearly highlights the significant year-to-year rate of return variability to the decision maker's wealth position. For example, in 1991 the firm realized a single year IRR on net worth of (21.50) percent, while the annualized IRR for the 1988-1991 period was 12.91 percent. At the end of the five-year period, under the assumptions of the RBRM model, the firm realized a nominal loss of (1.23) percent to net worth. The performance of the RBRM model will be contrasted in the next section with the Base Run Model (BRM).

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7.3 Base Run Model with All-Risk Crop Insurance and Forward Contracting Grain

7.3.1 Data Assumptions, Lender Credit Variables and Deterministic Parameters for the Firm

Model II, the Base Run Model (BRM), includes All-Risk Crop Insurance, forward contracting of grain and selection of the model's recommended optimal debt. The BRM model is based on the same macro economic assumptions and initial financial position of the firm as used with the RBRM model. The three primary differences between the RBM and the RBRM model are: the recommended optimal debt strategy is selected each period, All-Risk crop insurance is purchased for both crops, and forward contracting of commodities is undertaken to reduce price risk.

The following All-Risk Crop Insurance parameters were selected for the corn and soybean crops:

Table 7-8 All-Risk Crop Insurance Parameters

Corn:	
Guaranteed Yield:	78 bushels
Indemnity Price:	2.64 per bu.
Premium Cost:	7.27 per acre
Cash Flow Exposure:	(44,293)

Soybeans:	
Guaranteed Yield:	26 bushels
Indemnity Price:	6.31 per bu.
Premium Cost:	5.43 per acre
Cash Flow Exposure:	33,425

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With regard to forward contracting of grain, the maximum percentage allowed -- 50 percent-- was selected for each crop over the 1988-1992 period. The primary benefits to the firm of forward contracting include elimination of price variance and locking in the expected price for both corn and soybeans, rather than dealing with the uncertainity of randomly generated prices based on harvest month price trends. To illustrate this benefit, the expected Michigan corn price was 2.64 dollars per bushel for 1988 compared to a seasonally adjusted harvest month price of 2.42 dollars per bushel, a 9.09 percent price differential. For soybeans, the expected 1988 Michigan price was 9.01 dollars per bushel, compared to 8.60 dollars per bushel at harvest. In addition to the seasonal price differential, the firm is also exposed to stochastic price variability. For 1988, the model generated a stochastic price of 2.58 dollars for corn and 9.09 dollars for soybeans.

7.3.2 Analysis of Cash Flow Results

Table 7-9 presents the Cash Flow Summary Report for the BRM model for the period 1988-1992. Although the firm experienced a deficit net cash flow in 1988 and 1990, the firm's five-year average net cash flow is 32,977 dollars with a 93,717 dollar variance. As a result, the BRM model's coefficient of variation is 2.84. This compares to the RBRM model's coefficient of variation of 13.43. This clearly reveals that the RBRM model's annual net cash flow is sig-

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nificantly more volatile than the BRM model's net cash flow.

Table 7-9 summarizes the acquisition of capital assets over the five-year planning period, which ranged from a low of 51,382 in 1989 to 328,256 in 1991. The BRM model's recommended optimal debt solutions involved a combination of machinery purchases and rental of additional acreage. While additional acreage was available for purchase, the model did not select the purchase of additional acreage as an optimal strategy.

The purchase of All-Risk Crop Insurance paid off for the firm in 1990, when the firm realized a 60 bushel corn yield and 24 bushels of soybeans per acre. As a result, the firm received an insurance payment of 47,645 dollars.

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
	$ 328,194	$ 656,987	$ 293,731	$ 753,278	$ 772,985
	0	0	0	0	0

Cash Category	1988	1989	1990	1991	1992
Cash Flow Summary Report: 1988-1992					
SOURCES OF CASH					
Cash Receipts From Oper.	$ 388,104	$ 656,987	$ 293,731	$ 753,278	$ 772,985
Other Farm Income	0	0	47,645	0	0
Capital Asset Sales	0	0	0	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	143,190	41,106	64,041	262,605	127,589
TOTAL CASH AVAILABLE:	$ 551,294	$ 719,093	$ 427,468	$1,039,033	$ 924,874
USES OF CASH					
Total Cash Oper. Expenses	$ 284,133	$ 270,078	$ 305,716	$ 415,733	$ 435,814
Capital Asset Purchase	178,987	51,382	80,051	328,256	159,486
Intermed. and LT P&I Pmts	96,217	104,392	104,323	162,922	172,324
Taxes & Social Security	3,605	101,003	0	69,066	65,580
Family Living Withdrawal	14,806	20,000	8,000	20,000	20,000
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	0	0	0	0	0
TOTAL CASH REQUIRED:	$ 582,748	$ 551,856	$ 503,090	$1,000,978	$ 858,205
NET CASH FLOW (DEFICIT):	$ (31,454)	$ 167,237	$ (75,622)	$ 38,055	$ 66,669
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 305,285	$ 416,282	$ 554,550	$ 485,064	$ 631,155
Result in Bankruptcy	$ 422,680	$ 571,137	$ 725,751	$ 680,901	$ 865,057

Table 7-9 Base Run Model-Cash Flow Summary: 1988-1992

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7.3.3 Year-End Net Worth Position and Measures of Performance

Table 7-10 presents the firm's consolidated balance sheets for the period December 31, 1987 through December 31, 1992. The firm's current ratio with the BRM ranged between a low of 1.21:1 in 1991 and 3.54:1 in 1989. The current ratio for the firm in the RBRM model averaged significantly higher than the BRM because the RBRM firm was prohibited from purchasing assets above the required machinery purchase. As a consequence, the firm was forced to maintain a higher than desirable cash balance. The current ratio for the RBRM ranged between a low in 1987 of 1.56:1 to a high of 6.72:1 in 1989 and 6.39:1 in 1990.

Table 7-10 highlights that the firm in the BRM model experienced significantly higher average annual growth in net worth combined with lower volatility of growth than was the case for the RBRM firm. The coefficent of variation for the change in net worth for the BRM model is 0.756, while for the RBRM the coefficent of variation is 45.28.

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
					$ 112,503	$ 141,930

Balance Sheet Summary Report: December 31, 1987-1992						
Category	1987	1988	1989	1990	1991	1992
ASSETS						
Current Assets	$ 119,000	$ 85,453	$ 242,358	$ 150,701	$ 112,503	$ 141,930
Machinery	270,000	394,150	391,126	413,564	650,346	709,850
Real Estate	540,000	606,118	725,039	986,627	1,067,737	1,319,013
Total Owned Assets	$ 929,000	$1,085,720	$1,358,523	$1,550,892	$1,282,522	$2,170,793
Value Rental Acreage . . .	540,000	944,350	1,129,852	1,701,932	2,500,283	3,088,690
Total Owned & Rented Assets	$1,469,000	$2,030,070	$2,488,375	$3,252,824	$4,330,869	$5,259,483
LIABILITIES and NET WORTH						
Current Liabilities . . .	$ 76,500	$ 49,024	$ 68,470	$ 70,695	$ 93,595	$ 93,418
Intermediate Liabilities	81,599	157,241	153,807	163,243	300,368	322,549
Long Term Liabilities . .	187,500	247,082	318,367	285,422	396,523	458,642
Total Liabilities	$ 345,599	$ 453,347	$ 540,644	$ 519,360	$ 790,486	$ 874,609
Net Worth	$ 583,401	$ 632,374	$ 817,879	$1,031,531	$1,040,100	$1,296,184
Machinery to Land Ratio . . .	25.00%	25.40%	21.10%	15.40%	18.20%	16.10%
Change in Real Estate Value .	NA	$ 66,118	$ 118,920	$ 261,588	$ 81,110	$ 251,276
Change in Total Debt	NA	$ 107,748	$ 87,297	$ (21,284)	$ 271,126	$ 84,123
Change in Net Worth	NA	$ 48,973	$ 185,505	$ 213,652	$ 8,569	$ 256,084
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 405,899	$1,029,549	$ 594,177	$ 473,564	$ 643,752
Intermediate	373,785	370,974	385,506	397,223	417,692	480,003
Long Term	630,000	605,403	873,586	1,425,587	1,615,189	2,143,757
Weighted	$ 942,694	$1,019,145	$1,414,309	$1,809,590	$1,605,431	$2,066,068

Table 7-10 Base Run Model-Year End Balance Sheet: 1987-1992

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Table 7-11 presents the Operations and Financial Summary Report for the BRM model. With regard to the average net after-tax income per acre, the firm experienced a deficit in 1990, the same year the firm received a crop insurance payment. For three of the other four years the firm's net after-tax income per acre was relatively stable averaging 121.94 dollars per acre. The relative stability of the BRM model's net income per acre is in sharp contrast to the instability experienced with the RBRM model.

The GAMMA ratio for the BRM model declined from an initial GAMMA of 28.1 percent in 1987 to 16.1 percent in 1992. The value of the firm's real estate increased steadily from 900 dollars per acre in 1988 to 2,198 dollars per acre in 1992. This represents a five year total increase of 144.2 percent and an annualized rate of growth of 19.55 percent.

Over the five-year period, the firm increased rental acreage from 600 acres in 1988 and 1989 to 1,405 acres in 1991 and 1992. As a result of the increased rental acreage, total crop acreage increased from 1,200 acres in 1988 to 2,005 acres in 1991 and 1992.

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992
FINANCIAL					
					$ 385.53

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992
FINANCIAL					
Value of Farm Production/Acre	$ 252.84	$ 428.01	$ 208.79	$ 375.70	$ 385.53
Cost of Production/Acre. . . .	246.52	241.69	248.87	283.01	298.73
Net Income After Tax/Acre. . .	$ 6.32	$ 186.32	$ (40.08)	$ 92.69	$ 86.80
Real Estate Value Per Acre . .	$1,010	$1,208	$1,644	$1,780	$2,198
After Tax Return-Total Assets	6.54%	28.94%	2.87%	14.11%	12.18%
IRR on Net Worth-Year to Year	8.39%	29.33%	26.12%	0.83%	24.62%
IRR on Net Worth-Annualized	8.39%	18.40%	20.92%	15.55%	17.31%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	128	126	132
- Planning Yield (bu) .	160	126	122	111	115
- Actual Yield (bu) . .	108	138	60	134	111
- Planning Price. . . .	$3.03	$2.51	$2.61	$2.91	$2.57
- Actual Price	$2.58	$2.85	$2.63	$2.86	$3.21
Soybeans- Trend Yield (bu) . .	41	42	42	38	39
- Planning Yield (bu) .	41	53	32	36	24
- Actual Yield (bu) . .	26	45	24	43	43
- Planning Price. . . .	$9.45	$9.42	$8.36	$8.95	$8.23
- Actual Price	$9.09	$10.00	$7.90	$8.60	$9.48
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	935	935	1,035	1,405	1,405
Corn Acreage	614	614	654	802	802
Soybean Acreage	921	921	981	1,203	1,203

Table 7-11 Base Run Model-Operations and Financial Report: 1988-1992

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7.3.4 Summary

Over the five-year period, the BRM model firm experienced reduced variability in net cash flow, real estate valuation and return on owners equity (wealth). Table 7-11 summarizes the two measures of return to the firm's net worth-- the year-to-year Internal Rate of Return (IRR), and the initial year through the current year annualized IRR. The firm realized an year-to-year IRR above 20 percent in 1989, 1990 and 1992. The 0.83 percent year-to-year IRR in 1991 was expected given the negative net income per acre in 1990 and the adjustment methodology incorporated into the real estate valuation model.

For the five-year planning period the firm experienced an IRR of 17.31 percent, compared to (1.23) percent for the RBRM model. In summary, the BRM model performed as expected relative to the RBRM, given the use of risk management strategies and selection of the optimal debt recommendations.

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7.4 Base Run Model With Increasing Collateral Requirements

7.4.1 Data Assumptions and Deterministic Parameters for the Firm and Lenders

The third model, the Base Run Model With Increasing Collateral Requirements (BRM-ICR), is based on the same economic assumptions and initial financial position of the firm as the BRM model. The only difference is that in the BRM-ICR model, the required collateral for borrowing was increased by 100 percent. The credit variable that reflects collateral policy is the liquidity premium. The liquidity premium for each of the three asset categories was increased 100 percent beginning with the initial credit reserve calculation and maintained at 100 percent for the 1988-1992 period. Table 7-12 presents the base line and revised liquidity premiums.

Table 7-12 Lender's Collateral Policy Variables

CREDIT POLICY VARIABLE	LENDER		
	CURRENT	INTERMEDIATE	LONG TERM
Initial Liquidity Premium	.05	.15	.20
Revised Liquidity Premium	.10	.30	.40

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The collateral requirements had a significant impact on the firm's credit reserves. Table 7-13 presents a summary of the firm's restricted credit reserves based on the base line and revised liquidity premium values.

Table 7-13 Summary of the Firm's Restricted Credit Reserves

	COLLATERAL POLICY		CHANGE	
CATEGORY	**INITIAL**	**REVISED**	**DOLLAR**	**PERCENT**
Current	251,409	93,299	(158,110)	(62.9)
Intermediate . . .	373,785	79,192	(294,593)	(78.8)
Long term	630,000	142,500	(487,500)	(77.4)
Weighted	942,694	147,747	(794,947)	(84.3)

As a result of the collateral policy change, the firm's weighted restricted credit reserve was reduced by 794,947 dollars (84.3 percent). The potential economic and operations impact on the firm varies by credit category. For example, the firm's current debt credit reserve is accessed primarily to make cash lease payments for rental acreage and for balancing an end-of-year deficit cash flow position. Intermediate credit is used exclusively for financing the purchase of additional machinery. Long term credit serves two purposes for the firm: financing the purchase of additional real estate, and, more importantly, as a source of emergency liquidity for refinancing current debt and balancing an end-of-year deficit net cash flow position.

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Another indication of the negative impact of the change in collateral policy on the firm can be seen by examining the firm's cash flow exposure measures, MAXER and MAXEM. Under the revised collateral policy, the maximum cash flow deficit the firm can experience before exhausting its restricted credit reserve (MAXER) declined by 212,224 dollars, or 73.5 percent. At the same time, the maximum cash flow deficit the firm can experience before going bankrupt (MAXEM) declined by 203,369 dollars, or 51.3 percent.

In summary, the exogenous change in collateral policy made by the firm's lenders had two major impacts on the firm. First, it reduced the firm's ability to access credit for the acquisition of additional assets for business expansion, and in the case of restricting the purchase of additional machinery, the ability of the firm to improve operating efficiency. The second impact, and possibly more important than the first with regard to managing financial risk, is a reduction in the firm's ability to respond to a deficit cash flow. Without adequate credit reserves, the firm faces an increased probability of forced asset liquidation to balance a deficit cash flow. In the event of a significant cash flow deficit the firm faces an increased probability of bankruptcy.

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7.4.2 Analysis of Cash Flow Results

While the BRM-ICR firm experienced a deficit net cash flow in three of the five years, the average net cash flow was 13,456 dollars, with a standard deviation of 48,578 dollars. By comparison, the BRM model experienced a deficit net cash flow in two of the five years. The average net cash flow with the BRM model was 45,559 dollars with a standard deviation of 86,878 dollars.

A major difference between the BRM and the BRM-ICR models cash flow performance is increased variability of cash returns. The BRM model's cash flow performance resulted in a coeffcient of variation of 1.91, compared to the BRM-ICR model's coefficent of variation of 3.61 for cash flow performance. Based on these simulation results, the increasing of collateral requirements increased the firm's financial risk.

Table 7-14 summarizes the firm's cash flow performance for the BRM-ICR model. Over the five-year period, family consumption averaged 16,460 dollars per year, with the firm experiencing the 8,000 dollar minimum consumption in 1990. That year the firm purchased 94,461 dollars in machinery and experienced a soybean yield of 31 bushels and 88 bushels per acre for corn, which resulted in the receipt of a payment from the All-Risk Insurance coverage. The increase in the demand for cash required the decision maker to reduce family consumption to the minimum level.

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Cash Receipts From Oper.	$ 342,192	$ 477,328	$ 347,673	$ 322,400	$ 431,133
Other Farm Income	0	0	3,855	34,135	0
Capital Asset Sales	0	0	0	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	86,400	34,629	75,568	38,916	38,633
TOTAL CASH AVAILABLE:	$ 448,592	$ 532,957	$ 449,148	$ 418,602	$ 494,067
USES OF CASH					
Total Cash Oper. Expenses	$ 218,130	$ 223,115	$ 267,153	$ 285,854	$ 318,107
Capital Asset Purchase	108,000	43,286	94,461	48,645	48,292
Intermed. and LT P&I Pmts	79,265	78,924	86,684	82,602	80,581
Taxes & Social Security	20,259	64,551	2,044	0	18,830
Family Living Withdrawal	18,628	20,000	8,000	18,532	17,139
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	0	0	0	0	0
TOTAL CASH REQUIRED:	$ 449,283	$ 434,876	$ 463,342	$ 440,634	$ 487,949
NET CASH FLOW (DEFICIT):	$ (691)	$ 98,081	$ (14,194)	$ (22,032)	$ 6,118
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 61,659	$ 147,595	$ 266,854	$ 236,419	$ 145,165
Result in Bankruptcy	$ 184,321	$ 301,357	$ 445,280	$ 406,288	$ 312,521

Table 7-14 Base Run Model With Tight Collateral Policy-Cash Flow Summary: 1988-1992

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The firm received a second All-Risk Insurance payment of 34,135 dollars in 1991 when the firm realized a soybean yield of 17 bushels per acre, 58 percent of the 40 bushel trend yield.

7.4.3 Year-End Net Worth Position and Measures of Performance

Table 7-15 presents the firm's consolidated balance sheets for the period December 31, 1987 through December 31, 1992. The firm's current ratio with the BRM-ICR model peaked in 1989 at 2.89:1 and declined to steadily through 1992 to 1.38:1. The trend in the firm's current ratio, a measure of liquidity, for the BRM model was higher in five of the six periods than to the BRM-ICR model. Combining the firm's reduced liquidity position with reduced access to credit highlights the BRM-ICR firm's increased financial risk.

In addition to exposure to increased financial risk, the BRM-ICR firm also experienced increased variability in the annual change in net worth relative to the BRM model. Table 7-15 shows that the firm in the BRM-ICR model experienced only 50 percent of the total change in net worth over the five-year period compared to the BRM model. Further, the variability in the change in the firm's net worth, as measured by the coefficient of varation, was 236 percent greater with the BRM-ICR model than with the BRM model. The coefficent of variation for change in net worth for the BRM model is 0.756, while for the BRM-ICR model it is 2.54.

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
ASSETS						
Cash	$ 104,784	$ 111,412	$ 118,497	$ 126,064	$ 134,141	$ 142,757
Accounts Receivable	1,250,000	1,329,688	1,414,610	1,505,000	1,601,094	1,703,164
Inventory	2,500,000	2,659,375	2,829,219	3,010,000	3,202,188	3,406,328
Prepaid Expenses	75,000	79,781	84,877	90,300	96,066	102,190
Total Current Assets	3,929,784	4,180,256	4,447,203	4,731,364	5,033,489	5,354,439
Property, Plant & Equipment	5,000,000	5,318,750	5,658,438	6,020,000	6,404,375	6,812,656
Accumulated Depreciation	(1,000,000)	(1,106,250)	(1,223,672)	(1,353,750)	(1,497,969)	(1,657,910)
Net Property, Plant & Equipment	4,000,000	4,212,500	4,434,766	4,666,250	4,906,406	5,154,746
Goodwill	500,000	500,000	500,000	500,000	500,000	500,000
Other Intangible Assets	250,000	250,000	250,000	250,000	250,000	250,000
Total Assets	$ 8,679,784	$ 9,142,756	$ 9,631,969	$ 10,147,614	$ 10,689,895	$ 11,259,185
LIABILITIES						
Accounts Payable	$ 1,000,000	$ 1,062,500	$ 1,131,875	$ 1,204,000	$ 1,281,250	$ 1,362,531
Accrued Expenses	500,000	531,250	565,938	602,000	640,625	681,266
Short-Term Debt	1,000,000	1,062,500	1,131,875	1,204,000	1,281,250	1,362,531
Total Current Liabilities	2,500,000	2,656,250	2,829,688	3,010,000	3,203,125	3,406,328
Long-Term Debt	2,000,000	2,125,000	2,263,750	2,408,000	2,562,500	2,725,062
Total Liabilities	4,500,000	4,781,250	5,093,438	5,418,000	5,765,625	6,131,390
EQUITY						
Common Stock	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Retained Earnings	3,179,784	3,361,506	3,538,531	3,729,614	3,924,270	4,127,795
Total Equity	4,179,784	4,361,506	4,538,531	4,729,614	4,924,270	5,127,795
Total Liabilities & Equity	$ 8,679,784	$ 9,142,756	$ 9,631,969	$ 10,147,614	$ 10,689,895	$ 11,259,185

Category	1987	1988	1989	1990	1991	1992
Balance Sheet Summary Report: December 31, 1987-1992						
ASSETS						
Current Assets	$ 119,000	$ 73,400	$ 154,251	$ 121,141	$ 111,412	$ 104,784
Machinery	270,000	332,043	329,706	372,435	369,734	367,062
Real Estate	540,000	644,033	772,821	1,037,514	972,225	966,398
Total Owned Assets	$ 929,000	$1,049,476	$1,256,778	$1,531,089	$1,453,371	$1,438,244
Value Rental Acreage	540,000	644,033	772,821	1,322,830	1,239,587	1,232,158
Total Owned & Rented Assets	$1,469,000	$1,693,508	$2,029,599	$2,853,919	$2,692,958	$2,670,402
LIABILITIES and NET WORTH						
Current Liabilities	$ 76,500	$ 62,640	$ 53,343	$ 59,215	$ 80,052	$ 75,955
Intermediate Liabilities	81,599	122,281	120,585	144,043	140,461	138,801
Long Term Liabilities	187,500	248,504	277,796	241,803	225,901	313,655
Total Liabilities	$ 345,599	$ 433,426	$ 451,724	$ 445,062	$ 446,414	$ 528,411
Net Worth	$ 583,401	$ 616,050	$ 805,054	$1,086,027	$1,006,956	$ 909,833
Machinery to Land Ratio	25.00%	25.80%	21.30%	15.80%	16.70%	16.70%
Change in Real Estate Value	NA	$ 104,033	$ 128,788	$ 264,693	$ (65,289)	$ (5,827)
Change in Total Debt	NA	$ 87,827	$ 18,298	$ (6,662)	$ 1,352	$ 81,997
Change in Net Worth	NA	$ 32,649	$ 189,004	$ 280,973	$ (79,071)	$ (97,127)
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 81,654	$ 291,248	$ 216,750	$ 123,185	$ 118,121
Intermediate	373,785	64,290	66,159	48,722	55,273	60,408
Long Term	630,000	233,649	342,709	553,074	515,361	521,681
Weighted	$ 942,694	$ 120,049	$ 285,812	$ 502,746	$ 449,849	$ 276,606

Table 7-15 Base Run Model With Tight Collateral Policy-Year End Balance Sheet: 1987-1992

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The firm's net worth position with the BRM-ICR model increased from 583,401 dollars on December 31, 1987 to 1,006,956 dollars in 1991, before declining 97,123 dollars to 909,833 dollars on December 31, 1992. The decline in the firm's net worth position is due primarily to a 94,943 dollar increase in contingent tax liability.

The firm's real estate value per acre increased from 900 dollars in 1987 to 1,729 dollars (92.1 percent) in 1990 before declining 6.9 percent over two years to 1,610 dollars in 1992. The decline in value in 1991-1992 resulted from declining net income per acre in 1990 and 1991. Comparing the BRM model with the BRM-ICR model reveals a 588 dollar (36.5 percent) difference between the real estate value per acre in 1992.

Unlike the RBRM model, which realized a high degree of year-to-year variability in the per acre real estate values over the five-year period, the BRM-ICR model's real estate value per acre reflected the relative stability of the firm's net after-tax income per acre.

Table 7-16 summarizes selected operations and financial statistics for the BRM-ICR model firm. The crop prices generated during the BRM-ICR model simulation were, on average, lower than those for the BRM model over the five-year period. Yield performance was mixed, with the BRM-ICR model averaging 114.8 bushels of corn per acre while the BRM model averaged 110.2 bushels. For soybeans, the BRM model averaged 36.2 bushels to 32.0 bushels for the BRM-ICR model.

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992
FINANCIAL					
Value of Farm Production/Acre	$ 285.16	$ 397.77	$ 257.53	$ 261.20	$ 315.85
Cost of Production/Acre. . . .	248.28	252.63	259.09	270.58	293.38
Net Income After Tax/Acre. . .	$ 36.88	$ 145.14	$ (1.56)	$ (9.38)	$ 22.47
Real Estate Value Per Acre . .	$1,073	$1,288	$1,729	$1,620	$1,611
After Tax Return-Total Assets	9.51%	19.76%	3.96%	4.99%	5.96%
IRR on Net Worth-Year to Year	5.60%	30.70%	34.90%	(7.28)%	(9.65)%
IRR on Net Worth-Annualized	5.60%	17.47%	23.01%	14.62%	9.29%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	128	128	123
- Planning Yield (bu) .	153	115	95	98	88
- Actual Yield (bu) . .	114	145	88	100	127
- Planning Price. . . .	$2.66	$2.51	$2.50	$2.87	$2.69
- Actual Price	$2.36	$2.94	$2.73	$3.21	$2.51
Soybeans- Trend Yield (bu) . .	41	42	41	40	37
- Planning Yield (bu) .	39	27	44	37	34
- Actual Yield (bu) . .	34	38	31	17	40
- Planning Price. . . .	$9.07	$8.92	$7.91	$8.86	$8.06
- Actual Price	$8.77	$9.98	$8.36	$9.08	$7.86
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	600	600	765	765	765
Corn Acreage	480	480	546	546	546
Soybean Acreage	720	720	819	819	819

Table 7-16 Base Run Model With Tight Collateral Policy-Operations and Financial Report: 1988-1992

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The constraints on the firm's ability to expand operations due to the increased collateral requirements can be illustrated by examining total crop acreage for the BRM and BRM-ICR models.

Table 7-17 Summary of Total Crop Acreage

	Production Period				
MODEL	1988	1989	1990	1991	1992
BRM	1,535	1,535	1,635	2,005	2,005
BRM-ICR . .	1,200	1,200	1,365	1,365	1,365
DIFFERENCE .	335	335	270	640	640

The BRM firm increased its total acreage in 1988, 1990 and 1991. Increased acreage is the result of expanding the firm's rental acreage base. The combination of adequate current and intermediate credit with concurrent maintenance of the firm's liquidity position enabled the BRM firm to take advantage of opportunities for expanding the firm's profit potential. The ability of the BRM firm to expand its production capability contrasts sharply with the limited growth potential of the BRM-ICR firm. The BRM-ICR firm, with its limited access to current and intermediate credit, had the resources to expand crop acreage in one out of five years and then by only 165 acres of rental land and the required machinery component. The model's debt optimization routine identified the firm's initial debt position as the

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optimal selection in three of the five years. For 1988, the optimal debt recommendation involved the purchase of 108,000 dollars of machinery (86,400 dollars machinery debt), 74,220 dollars (59,376 dollars machinery debt) above the required machinery purchase.

7.4.4 Summary

The firm in the BRM-ICR model experienced increased net cash flow variability, and reduced growth in net worth (wealth) relative to the BRM model. Table 7-16 summarizes the two measures of return to the firm's net worth-- the year-to-year Internal Rate of Return (IRR), and the initial year through the current year annualized IRR. The firm realized an average year-to-year IRR of 10.85 percent, with returns over 30 percent in 1989 and 1990 and negative returns in 1991 and 1992. For the five-year planning period the firm experienced an IRR of 9.29 percent, compared to 17.31 percent for the BRM model.

In summary, the firm in the BRM-ICR model experienced increased financial risk combined with constrained growth opportunities. Given this situation, the determined decision maker would have the economic incentive to bypass current restrictive lenders and seek alternative sources of debt capital to take advantage of growth opportunities. From the lender's perspective, these decision makers will complicate future credit administration with the introduction of split credit, thereby making it more difficult for a current

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Besides the implications for existng borrowers, increasing collateral requirements creates an adverse selection effect. As stated by Stiglitz and Weiss 'both the average and the marginal borrower who borrows is riskier'. The results of the BRM-IRC model appear to support Stiglitz and Weiss' theorem that the adverse selection effect may more than offset the bank's desired positive effect.

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7.5 Base Run Model With Increasing Nominal Interest Rates

7.5.1 Data Assumptions and Deterministic Parameters for the Firm and Lenders

The fourth model, the Base Run Model With Increasing Nominal Interest Rates (BRM-INIR), is based on the same economic assumptions and initial financial position of the firm as for the BRM model, with the exception that the level of nominal interest rates increases over the five-year period. In year one, the interest rates paid by the firm for all three debt categories are 10 percent higher than the nominal interest rates paid in year one of the BRM model.

For the second through the fifth year, the nominal interest rates from the preceeding year are increased an additional 10 percent. For example, the operating loan rate for 1989 is calculated by multiplying the 1988 rate by 110 percent to obtain 11.20 percent (10.18*1.10=11.20). This methodology compounds the interest rates in subsequent periods. Table 7-18 presents the nominal interest rates used in the BRM and BRM-INIR models, the difference between the interest rates, and the percentage change between the BRM-INIR interest rates and the BRM model interest rates.

While rising nominal interest rates do not affect the firm's restricted or maximum credit reserves, rising interest rates reduce the firm's ability to withstand deficit cash flow outcomes. For example, the 10 percent increase in the interest rates in the first year reduced the MAXER cash

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Table 7-18 Summary of Nominal Interest Rates

DEBT CATEGORY	Production Period 1988	1989	1990	1991	1992
Current					
BRM	9.25	9.75	8.95	8.55	8.65
BRM-INIR . . .	10.18	11.19	12.31	13.54	14.90
Difference . .	.93	1.44	3.36	4.99	6.25
Percent Change	10.05	14.77	37.54	58.36	72.25
Intermediate					
BRM	9.85	10.35	9.55	9.15	9.25
BRM-INIR . . .	10.84	11.92	13.11	14.43	15.87
Difference . .	.99	1.57	3.56	5.28	6.62
Percent Change	10.05	15.17	37.28	57.71	71.57
Long Term					
BRM	10.75	11.25	10.45	10.05	10.15
BRM-INIR . . .	11.83	12.28	13.51	14.86	16.35
Difference . .	1.08	1.03	3.06	4.81	6.20
Percent Change	10.05	9.16	29.28	47.86	61.08

Difference= (BRM-INIR)-(BRM)
Percent Change= Difference/BRM

cash measure by 16,554 dollars. Therefore, an increase in nominal interest rates increases the firm's scheduled debt repayment commitment and increases the firm's demand for cash.

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7.5.2 Analysis of Cash Flow Results

While the firm in the BRM-INIR model experienced a 64,266 dollar deficit cash flow in year one, for the five-year period the average net cash flow is 43,878 dollars, only 1,681 dollars less than the BRM model's average net cash flow. For the five-year period, the BRM-INIR model had both a smaller variance in net cash flow and a smaller coefficent of variation than the BRM model.

Despite the increased nominal interest rates and subsequently larger interest payments on the firm's debt, the BRM-INIR firm's cash receipts from operations in this simulation benefited from stochastic yield outcomes in three of the five years that were equal to or above the firm's corn and soybean trend yields. The favorable yield outcomes combined with stochastic prices that were inline with expected prices resulted in farm receipts that more than offset the increased interest payments.

While the BRM model averaged 1,743 acres per year over the five-year period, the BRM-INIR model averaged 1,707 acres per year. Despite an average of 36 fewer acres per year over the five years, the BRM-INIR model generated total farm receipts of 3,044,647 dollars, 179,562 dollars more than the BRM model.

Table 7-19 presents the five-year Cash Flow Summary for the BRM-INIR model. In 1988 the BRM-INIR firm received an All-Risk Crop Insurance payment as a result of corn and soybean yields below the insured guaranteed yield levels. In

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addition, in 1988 the firm liquidated 6,779 dollars of machinery in response to the recommended optimal GAMMA solution of 27.5 percent, compared to the the initial GAMMA ratio of 28.128 percent. The BRM-INIR model recommended increasing rental acreage by 400 acres in 1988, along with purchasing the necessary machinery component at a cost of 99,000 dollars. The recommended combination of owned and rented assets generated a planning after-tax rate of return on total assets (ATROI) of 31.2 percent for 1988. The simulated ATROI with the depressed crop yields was 2.6 percent.

The BRM-INIR model recommended a total rented acreage increase of 534 acres over the five-year period, with a 400 acre increase in year one and 134 additional acres in year two. This acreage expansion plan compares to 805 additional acres for the BRM model and 645 additional acres for the BRM-IRP model. The BRM model recommended 335 additional rental acres in year one, while the BRM-IRP model recommended 345 acres in year one and 300 acres in year two. Of all the models evaluated, the BRM-INIR model recommended the largest increase in additional rental acreage in year one, 400 acres. While the BRM-INIR model expanded rental acreage more than the other models in year one, the BRM-INIR and BRM-IRP models selected the lowest optimal GAMMA ratio at 27.5 percent in year one as a means of maximizing end-of-period wealth for the decision maker.

SOURCES OF CASH

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992

Cash Flow Summary Report: 1988-1992					
Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Cash Receipts From Oper.	$ 333,084	$ 560,713	$ 677,549	$ 646,872	$ 826,429
Other Farm Income	10,229	0	0	5,376	145
Capital Asset Sales	6,779	0	109,498	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	100,461	125,870	46,450	89,914	411,501
TOTAL CASH AVAILABLE:	$ 470,554	$ 707,584	$ 855,548	$ 765,314	$1,262,376
USES OF CASH					
Total Cash Oper. Expenses	$ 301,974	$ 306,294	$ 321,054	$ 350,710	$ 374,762
Capital Asset Purchase	126,000	157,337	58,063	112,393	514,377
Intermed. and LT P&I Pmts	92,829	132,285	195,095	123,631	258,619
Taxes & Social Security	0	55,095	86,627	67,151	77,348
Family Living Withdrawal	8,000	20,000	20,000	20,000	20,000
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	1,016	0	16,424	0	0
TOTAL CASH REQUIRED:	$ 534,820	$ 676,012	$ 702,164	$ 678,886	$1,250,106
NET CASH FLOW (DEFICIT):	$ (64,266)	$ 31,572	$ 153,384	$ 86,428	$ 12,270
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 245,205	$ 180,789	$ 388,911	$ 504,546	$ 509,700
Result in Bankruptcy	$ 352,165	$ 297,251	$ 534,316	$ 679,626	$ 725,589

Table 7-19 Base Run Model With Increasing Interest Rates-Cash Flow Summary: 1988-1992

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In response to the potential for reduced profitability in 1990, the BRM-INIR model recommended liquidation of 109,498 dollars of machinery. This action reduced the firm's GAMMA ratio from an initial ratio of 31.98 percent to 25.0 percent. The asset liquidation increased the firm's expenditures by 16,424 dollars. Despite the increased costs associated with asset liquidation, for the 1990 planning process the model's optimal debt strategy generated an ATROI of 26.9 percent. The simulated ATROI for 1990 turned out to be 28.1 percent.

7.5.3 Year-End Net Worth Position and Measures of Performance

Table 7-20 summarizes the firm's consolidated balance sheets, restricted credit reserve summary and selected financial measures for the 1988-1992 period. The financial performance of the BRM-INIR model is very similiar to the BRM model in terms of growth and stability of net worth, and the firm's mix of assets and debt.

The firm experienced a decline in net worth in 1988 as a result of the 64,266 dollar deficit cash flow. Because the firm did not have an adequate cash reserve to meet the cash flow deficit, the model balanced the end-of-period cash flow by refinancing the cash deficit with long term debt. As part of the computer model's long term debt refinancing methodology, if the firm's real estate credit reserve is adequate the cash flow deficit and the firm's operating loan balance are refinanced with long term debt.

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As a result of the long term debt refinancing option, the composition of firm's total debt -- current, intermediate and long term -- shifted significantly. From a percentage distribution of 24, 35 and 40 percent on January 1st, the debt mix was 9, 29, and 60 percent, respectively, on December 31, 1988.

The firm's liquidity position, as measured with the current ratio, improved in 1988 despite the deficit net cash flow performance as a result of the long term debt refinancing. The current ratio declined to the minimum current ratio at the end of 1989 (1.20:1), before improving to 4.35:1 in 1990 and 5.25:1 in 1991 on the strength of the net cash flow performance in both years.

The BRM-INIR firm's average change in net worth was second only to the BRM model. For the five-year period, the BRM-INIR model had an average annual growth in net worth of 103,888 dollars, with a standard deviation of 139,888 dollars and a coefficient of variation of 1.35.

Over the five year period, the model recommended the purchase of 968,170 dollars of machinery, 514,377 dollars (53.1 percent) of machinery in 1992 alone. As a result, the model recommended a GAMMA ratio in the 24.3 to 28.3 percent range between 1987 and 1989. The firm realized nearly 100 percent of the total change in real estate value in 1989 through 1992. As a result, the GAMMA ratio declined sharply to 16.4 percent in 1991 before increasing to 27.6 percent on

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
ASSETS						
Current Assets	$ 119,000	$ 96,050	$ 95,997	$ 225,467	$ 282,995	$ 188,827
Machinery	270,000	347,791	443,267	343,852	400,209	801,206
Real Estate	540,000	537,490	542,015	701,243	843,423	1,005,475
Total Owned Assets	$ 929,000	$ 981,331	$1,081,279	$1,270,562	$1,526,626	$1,995,508
Value Rental Acreage	540,000	895,817	1,025,311	1,326,517	1,595,474	1,902,023
Total Owned & Rented Assets	$1,469,000	$1,877,148	$2,106,589	$2,597,079	$3,122,100	$3,897,531
LIABILITIES and NET WORTH						
Current Liabilities	$ 76,500	$ 43,914	$ 81,105	$ 51,894	$ 53,896	$ 108,675
Intermediate Liabilities	81,599	129,894	186,712	119,049	153,896	386,430
Long Term Liabilities	187,500	269,580	313,374	332,171	361,831	397,562
Total Liabilities	$ 345,599	$ 443,388	$ 581,191	$ 503,115	$ 568,978	$ 892,666
Net Worth	$ 583,401	$ 537,943	$ 500,088	$ 767,448	$ 957,648	$1,102,842
Machinery to Land Ratio	25.00%	24.30%	28.30%	17.00%	16.40%	27.60%
Change in Real Estate Value	NA	$ (2,510)	$ 4,525	$ 159,228	$ 142,180	$ 162,052
Change in Total Debt	NA	$ 97,789	$ 137,803	$ (78,076)	$ 65,863	$ 323,688
Change in Net Worth	NA	$ (45,458)	$ (37,855)	$ 267,360	$ 190,200	$ 145,194
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 456,238	$ 456,238	$1,001,798	$1,309,639	$ 879,634
Intermediate	373,785	370,661	370,661	414,987	410,777	429,627
Long Term	630,000	364,591	364,591	761,359	1,077,775	1,432,333
Weighted	$ 942,694	$ 827,504	$ 827,504	$1,311,468	$1,706,293	$1,720,366

Table 7-20 Base Run Model With Increasing Interest Rates-Year End Balance Sheet: 1987-1992

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992

Category	1988	1989	1990	1991	1992
Operations and Financial Summary Report: 1988-1992					
FINANCIAL					
Value of Farm Production/Acre	$ 214.57	$ 323.18	$ 390.52	$ 375.94	$ 476.41
Cost of Production/Acre. . . .	243.14	248.25	243.63	271.99	355.01
Net Income After Tax/Acre. . .	$ (28.57)	$ 74.93	$ 146.89	$ 103.95	$ 121.40
Real Estate Value Per Acre . .	$ 896	$ 903	$1,169	$1,406	$1,676
After Tax Return-Total Assets	2.57%	18.67%	28.08%	18.38%	17.63%
IRR on Net Worth-Year to Year	(7.79)%	(7.04)%	53.46%	24.78%	15.16%
IRR on Net Worth-Annualized	(7.79)%	(7.42)%	9.57%	13.19%	13.58%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	126	128	134
- Planning Yield (bu) .	163	74	166	98	145
- Actual Yield (bu) . .	73	114	135	153	189
- Planning Price. . . .	$2.86	$2.67	$2.58	$2.73	$3.23
- Actual Price	$2.64	$2.72	$3.00	$2.63	$2.89
Soybeans- Trend Yield (bu) . .	41	42	40	40	41
- Planning Yield (bu) .	58	23	39	30	49
- Actual Yield (bu) . .	26	34	40	45	52
- Planning Price. . . .	$9.42	$9.63	$8.91	$8.28	$8.81
- Actual Price	$8.47	$9.72	$9.64	$7.90	$8.31
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	1,000	1,134	1,134	1,134	1,134
Corn Acreage	640	694	694	694	694
Soybean Acreage	960	1,041	1,041	1,041	1,041

Table 7-21 Base Run Model With Increasing Interest Rates-Operations and Financial Report: 1988-1992

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December 31, 1992. In 1992, the model recommended an optimal GAMMA ratio of 37.5 percent.

The value of the firm's real estate increased 87.1 percent over the five-year period, to 1,676 dollars per acre in 1992. Even though the firm realized a deficit net cash flow of 64,266 dollars in 1988, real estate declined only four dollars per acre to 896 dollars as of December 31, 1988.

Table 7-21 presents selected operations and financial data for the BRM-INIR model. Notably, despite the increased nominal interest rates, the model recommended expanding the firm's total crop acreage in 1988 and 1989 while maintaining total crop land at 1,734 acres for the 1990-1992 period.

7.5.4 Summary

The firm in the BRM-INIR model experienced the most stable annual net cash flow and had the smallest coefficient of variation of any of the models examined. This result can be explained in part by the favorable random yields and prices realized by the firm over the five-year period. The stable net cash flow result could change significantly if the BRM-INIR model was simulated again.

Table 7-21 summarizes the two measures of return to the firm's net worth -- the year-to-year Internal Rate of Return (IRR), and the initial year through the current year annualized IRR. The firm realized an average year-to-year IRR of 15.71 percent, incurring negative returns in 1988 and 1989

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before realizing a 53.46 percent IRR in 1990. The 53.46 percent year-to-year IRR in 1990 was significantly higher than any year-to-year IRR realized in the other models. While this IRR is appears to be well outside the expected range of returns, it can be explained by a combination of factors. Reasonable prices and trend yields generated in 1990, together with the recommended optimal debt strategy calling for the liquidation of 109,498 dollars of machinery in light of increasing nominal interest rates, provided the basis for the 153,384 dollar net cash flow for the period. The model's recommended optimal GAMMA ratio and debt liquidation strategy resulted in reducing the firm's 1990 cost of production per acre below that for the BRM model.

In addition to the favorable net cash flow, the firm's real estate appreciated 266 dollars per acre (29.45 percent) in 1990. The real estate capital gain resulted from two primary factors: the 147 dollar net income per acre in 1990 and the formula used for revaluation of real estate in the model.

For the five-year planning period the firm experienced an IRR of 13.58 percent, compared to 17.31 percent for the BRM model and (1.23) percent for the RBRM model. In summary, the BRM-INIR model performed above reasonable expectations, given the expected impact of increasing nominal interest rates on the firm's profitability. The model's debt optimization routine recommended strategies which, given the expected increased cost of production, increased the deci-

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7.6 Base Run Model With Incentive Interest Rate Program

7.6.1 Data Assumptions and Deterministic Parameters for the Firm and Lenders

The fifth model, the Base Run Model With Incentive Interest Rate Program (BRM-IRP), is similiar to the BRM Model in that it is based on most of same economic assumptions and the same initial financial position of the firm. The BRM-IRP Model differs from the BRM Model in the credit programs offered the firm by its intermediate and long term lenders. The credit policy and loan requirements for the lender providing operating credit have been held constant with the provisions of the BRM model. The modified credit programs contained in the BRM-IRP model apply only to those lenders supplying the firm with debt capital for the financing of machinery and real estate acquisition.

The intermediate and long term lenders offer the firm a 10.0 percent reduction from their regular interest rates in exchange for reducing the term of the loan by 20.0 percent, together with an increase of 50.0 percent in the required equity investment (cash down payment percentage) for subsequent asset purchases that the firm wants to finance in part with debt. Table 7-22 summarizes the intermediate and long term lender's initial and revised credit program variables.

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Table 7-22 Lender's Credit Policy Variables
Incentive Interest rate Program

CREDIT POLICY VARIABLE	LENDER	
	INTERMED.	LONG TERM
Cash Down Payment-Percentage		
Initial	20.0	20.0
Revised	30.0	30.0
Percent Change	50.0	50.0
Term of Loan-Number of Years		
Initial	5	20
Revised	4	16
Percent Change	(20.0)	(20.0)

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In return for agreeing to the credit policy changes presented in Table 7-22, the firm receives a 10.0 percent reduction from the lender's current interest rate program. Table 7-23 summarizes the firm's initial and revised interest rates under the BRM-IRP model assumptions.

Table 7-23 Summary of Revised Nominal Interest Rates

	Production Period				
DEBT CATEGORY	**1988**	**1989**	**1990**	**1991**	**1992**
Intermediate					
BRM	9.85	10.35	9.55	9.15	9.25
BRM-IRP	8.87	9.32	8.60	8.24	8.33
Difference . .	0.98	1.03	0.95	0.91	0.92
Long Term					
BRM	10.75	11.25	10.45	10.05	10.15
BRM-IRp	9.68	10.13	9.41	9.05	9.14
Difference . .	1.07	1.12	1.04	1.00	1.01

The lender's revised credit program has two immediate consequences for the firm:

(1) In order for the firm to acquire additional assets the firm must have the required cash on hand to make the equity investment in the asset.

(2) The firm's operating expenses are reduced as a result of the lower nominal interest rates. However, the firm has an increased demand for after-tax cash to make the increased principal payments.

Table 7-24 presents a simplified amortization example which illustrates the tradeoff between reduced interest payment

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vs. increased total debt repayment (principal and interest) as a result of the shorter amorization period. The analysis presented intentionally ignores the principal of present value of money. That is, by delaying principal payments to later years, the decision maker can repay the loan with 'cheaper' dollars. For purposes of this study, it is assumed that in the decision maker's view, the revised loan program offers the opportunity for reduced interest payments to the bank in exchange for increased principal payments.

Table 7-24 Loan Amortization Example

Year		Beg. Loan Balance	Interest Rate	Interest Payment	Prin. Pmt	Total Pmt	Percent Change
1	I:	10,000	9.85	985	2,000	2,985	--
	R:	10,000	8.87	887	2,500	3,387	13.47
2	I:	8,000	10.35	828	2,000	2,828	--
	R:	7,500	9.32	699	2,500	3,199	13.12
3	I:	6,000	9.55	573	2,000	2,573	--
	R:	5,000	8.60	430	2,500	2,930	13.88
4	I:	4,000	9.15	366	2,000	2,366	--
	R:	2,500	8.24	206	2,500	2,706	14.37
5	I:	2,000	9.25	185	2,000	2,185	--
	R:	0	8.33	0	0	0	NA

Summary:	Total Interest	Total Payment
Initial . . .	2,937	12,937
Revised . . .	2,222	12,222
Difference:	715	715

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In summary, changing the credit variables discussed for the BRM-IRP model has no effect on the firm's restricted or maximum credit reserves. However, the net tradeoff is that a reduction in interest payments in exchange for increased annual principal repayment increases the firm's cash flow requirements.

Further, by requiring increased equity investment in future asset purchases, the firm has limited capability to expand its productive capacity or take advantage of investment opportunities.

7.6.2 Analysis of Cash Flow Results

Similiar to the BRM model, the BRM-IRP firm experienced a deficit cash flow in two of the five years, 1988 and 1990. For the five-year period, the average net cash flow was 36,898 dollars, 8,661 dollars less than the BRM model. However, the 2.12 coefficient of variation for the BRM-IRP model compares very favorably with the BRM model at 1.91.

The increased cash down payment requirement did not prove to be a limitation in 1988 when the model recommended an increase in rental acreage of 345 acres, the second largest first-year acreage increase of any of the models (BRM-INIR selected 400 acres), along with the purchase of 85,388 dollars of machinery. The optimal GAMMA ratio for 1988 was 27.5 percent, only slightly less than the initial GAMMA of 28.128 percent.

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Table 7-25 summarizes the five-year Cash Flow Summary for the BRM-IRP model. The 69,742 dollar deficit cash flow in 1988, combined with limited internal liquidity after purchasing 112,387 dollars of machinery for the year, forced the firm to finance the deficit and the firm's current liability balance by refinancing with long term debt. This action improved the firm's liquidity position as measured by the current ratio. The deficit cash flow in 1988 was the result of poor corn (73 bushels) and soybean (26 bushels) yields. The firm received an All-Risk Insurance payment of 9,878 for the period. The BRM-IRP firm experienced a 33,837 dollar deficit cash flow in 1990, which was balanced by utilizing the firm's cash.

For the five-year period the firm purchased 509,817 dollars of assets, approximately 175,000 dollars of which represented required machinery purchases. This compares to the BRM model with 798,162 dollars and the BRM-INIR with 968,170 dollars in machinery purchases. The BRM-IRP model ranked first for expansion of the firm's acreage base by year two. A total of 645 acres were added to the firm's cropland base through year two, significantly ahead of the BRM-INIR model with 534 acres. Despite the increased cash down payment requirement, the BRM-IRP firm purchased 167,029 dollars of machinery, which required a cash investment of 50,109 dollars.

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The BRM-IRP firm paid a total of 555,088 dollars in intermediate and long term interest and principal payments over the five-year period. By comparison, the BRM firm paid a total of 640,178 dollars in principal and interest payments, **85,090 dollars more than** the BRM-IRP firm.

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Cash Receipts From Oper.	$ 321,634	$ 701,722	$ 458,575	$ 683,389	$ 697,237
Other Farm Income	9,878	0	0	0	0
Capital Asset Sales	6,779	0	0	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	77,654	116,920	73,164	43,785	44,331
TOTAL CASH AVAILABLE:	$ 435,946	$ 839,643	$ 553,790	$ 750,324	$ 765,868
USES OF CASH					
Total Cash Oper. Expenses	$ 289,455	$ 333,027	$ 330,244	$ 372,553	$ 419,139
Capital Asset Purchase	112,387	167,029	104,521	62,550	63,330
Intermed. and LT P&I Pmts	89,829	125,266	122,947	111,922	105,124
Taxes & Social Security	0	90,918	8,725	75,703	66,203
Family Living Withdrawal	8,000	20,000	16,189	20,000	20,000
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	1,016	0	0	0	0
TOTAL CASH REQUIRED:	$ 505,688	$ 741,241	$ 587,627	$ 647,729	$ 678,796
NET CASH FLOW (DEFICIT):	$ (69,742)	$ 98,402	$ (33,837)	$ 102,595	$ 87,072
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 281,331	$ 301,464	$ 461,001	$ 509,610	$ 696,934
Result in Bankruptcy	$ 392,253	$ 435,456	$ 622,548	$ 690,198	$ 916,442

Table 7-25 Base Run Model With Interest Rate Incentive Program-Cash Flow Summary: 1988-1992

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7.6.3 Year-End Net Worth Position and Measures of Performance

Table 7-26 summarizes the BRM-IRP model's consolidated balance sheet, restricted credit reserve summary and selected financial measures for the 1988-1992 period. The firm experienced a positive increase in net worth in each of the five years. The BRM model was the only other model to experience five consecutive years of positve net worth change. The BRM-IRP model averaged 144,246 dollars of increased net worth per year, compared to an average of 142,557 dollars per year for the BRM model. The BRM-IRP model's net worth had a standard deviation of 124,551 dollars and a coefficient of variation of 0.86. This compares to a coefficient of variation for the BRM model of 0.76.

Over the five year period the BRM-IRP model had an end-of-year GAMMA ratio that ranged between a low of 11.9 percent in 1992 and 28.128 percent on December 31, 1987. During the optimization process the model recommended a GAMMA ratio of 27.5 percent in 1988-1990. It was not until 1991, when the firm's real estate appreciated 260,625 dollars, that the GAMMA ratio declined below 20.0 percent. In 1991 the model selected the firm's initial GAMMA ratio of 19.4 percent as the optimal GAMMA ratio. In 1992, the model selected a GAMMA of 17.5 percent, 0.04 percent above the firm's beginning-of-period initial GAMMA ratio.

The optimal GAMMA search routine was constrained by the increased cash down payment percentage in several years.

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While the search routine is programmed to evaluate GAMMAs between a minimum of 15.0 and 40.0 percent, the model was constrainted in each of the five years. The maximum GAMMA evaluated during the optimal debt search routine began with 37.7 percent in 1988 and declined to 19.4 percent in 1991, before increasing to 21.7 percent in 1992. The increase to 21.4 percent is the direct result of the 102,595 dollar net cash flow in 1991.

As with the BRM model, the BRM-IRP model was the only other model evaluated that generated a positive capital gain increase to the firm's real estate value each year. The average increase in real estate appreciation was 149,590 dollars per year. The firm's real estate increased in value 1,247 dollars per acre, or 138.6 percent over the five-year period. Despite the cash flow deficit in both 1988 and 1990, the firm's real estate appreciated in value each year.

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992
ASSETS						
Current Assets	$ 119,000	$ 87,534	$ 135,772	$ 104,415	$ 166,737	$ 214,628
Machinery	270,000	335,882	441,327	478,893	475,038	472,348
Real Estate	540,000	594,722	645,497	906,122	1,000,452	1,287,951
Total Owned Assets	$ 929,000	$1,018,137	$1,222,596	$1,489,430	$1,642,226	$1,974,928
Value Rental Acreage	540,000	936,686	1,339,407	1,880,203	2,075,938	2,672,500
Total Owned & Rented Assets	$1,469,000	$1,954,823	$2,562,003	$3,369,633	$3,718,164	$4,647,428
LIABILITIES and NET WORTH						
Current Liabilities	$ 76,500	$ 48,348	$ 88,879	$ 123,851	$ 97,524	$ 73,716
Intermediate Liabilities	81,599	101,530	143,702	148,292	137,634	128,909
Long Term Liabilities	187,500	278,775	325,008	298,170	398,787	467,671
Total Liabilities	$ 345,599	$ 428,652	$ 557,588	$ 570,313	$ 633,946	$ 670,296
Net Worth	$ 583,401	$ 589,485	$ 665,008	$ 919,117	$1,008,280	$1,304,632
Machinery to Land Ratio	25.00%	21.90%	22.20%	17.20%	15.40%	11.90%
Change in Real Estate Value	NA	$ 54,722	$ 50,775	$ 260,625	$ 94,330	$ 287,499
Change in Total Debt	NA	$ 83,053	$ 128,936	$ 12,725	$ 63,633	$ 36,350
Change in Net Worth	NA	$ 6,084	$ 75,523	$ 254,109	$ 89,163	$ 296,352
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 415,785	$ 484,631	$ 140,988	$ 560,557	$ 903,762
Intermediate	373,785	440,908	531,213	607,102	657,738	694,716
Long Term	630,000	467,631	614,295	1,177,838	1,406,149	2,018,320
Weighted	$ 942,694	$ 935,256	$1,019,308	$1,504,830	$1,684,322	$2,271,373

Table 7-26 Base Run Model With Interest Rate Incentive Program-Year End Balance Sheet: 1987-1992

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Table 7-27 presents selected operations and financial statistics for the BRM-IRP model. The actual yield data in Table 7-27 reveals that with the exception of 1988, when the firm received an All-Risk Insurance payment as a result the corn yield averaging 73 bushels per acre, and soybeans averaging 26 bushels per acre, the realized yields were very stable. The stochastic commodity prices generated for the BRM-IRP model were below the random prices generated during the BRM model simulation in three out of the five years, for both corn and soybeans. Poor price performance contributed to the negative net income per acre in 1992.

Total cropland increased to 1,845 acres over the five-year period. While owned acreage was held constant at 600 acres, rental acreage increased by 645 acres during 1988 and 1989, and was then held constant for the 1990-1992 period. The BRM-IRP model's increase in the firm's acreage base was second only to the 805 additional rental acres added to the firm in the BRM model.

Operations and Financial Summary Report: 1988-1992

Category	1988	1989	1990	1991	1992

Operations and Financial Summary Report: 1988-1992					
Category	1988	1989	1990	1991	1992
FINANCIAL					
Value of Farm Production/Acre	$ 214.57	$ 380.34	$ 248.55	$ 370.40	$ 262.62
Cost of Production/Acre. . . .	236.64	239.38	238.60	258.64	282.54
Net Income After Tax/Acre. . .	$ (22.07)	$ 140.96	$ 9.95	$ 111.76	$ (19.92)
Real Estate Value Per Acre . .	$ 991	$1,076	$1,510	$1,667	$2,147
After Tax Return-Total Assets	2.72%	27.20%	5.96%	16.57%	12.69%
IRR on Net Worth-Year to Year	1.04%	12.81%	38.21%	9.70%	29.39%
IRR on Net Worth-Annualized	1.04%	6.70%	16.36%	14.66%	17.46%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	128	124	126
- Planning Yield (bu) .	131	157	164	122	167
- Actual Yield (bu) . .	73	149	102	121	149
- Planning Price. . . .	$2.95	$2.99	$2.29	$3.29	$3.18
- Actual Price	$2.64	$2.46	$2.24	$3.26	$2.89
Soybeans- Trend Yield (bu) . .	41	42	42	40	39
- Planning Yield (bu) .	45	41	38	35	34
- Actual Yield (bu) . .	26	44	33	36	41
- Planning Price. . . .	$9.41	$10.19	$7.45	$9.64	$8.70
- Actual Price	$8.47	$8.89	$7.94	$9.76	$8.31
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	945	1,245	1,245	1,245	1,245
Corn Acreage	618	738	738	738	738
Soybean Acreage	927	1,107	1,107	1,107	1,107

Table 7-27 Base Run Model With Interest Rate Incentive Program-Operations and Financial Report: 1988-1992

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7.6.4 Summary

The firm in the BRM-IRP model experienced a rate of growth in net worth (wealth) second only to the net worth growth rate of the BRM model. Table 7-27 summarizes the two measures of return to the firm's net worth -- the year-to-year Internal Rate of Return (IRR), and the initial year through the current year annualized IRR. The firm realized an average year-to-year IRR of 18.23 percent, with two year-to-year IRRs over 25 percent, 1990 and 1992. As with the BRM model, the BRM-IRP model did not experience negative year-to-year IRR.

As for the five-year IRR, the BRM-IRP model experienced the highest return with 17.46 percent. The five-year BRM-IRP model's IRR was 0.14 percent higher than the BRM model.

In summary, from the decision maker's perspective, the BRM-IRP model ranked first for maximization of wealth of the six models examined. While the firm in the BRM-IRP model did not experience the smallest degree of financial risk, the model's 2.23 coefficient of variation for annual growth in net worth was only 0.34 above the BRM.

Though the revised credit policy -- requiring a 50 percent increase in the firm's equity investment in assets being purchased -- limited the model's optimal debt search routine, the firm's liquidity position fell below the minimum acceptable liquidity level in 1990, the second year the firm experienced a deficit net cash flow.

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From the lender's perspective, the bank's expected return could be increased by requiring current and subsequent borrowers to increase the percentage of an asset's purchase price financed with equity (Stiglitz and Weiss). Requiring borrowers to increase the required equity investment in assets being considered for financing up to a point, can serve to reduce the bank's potential for experiencing a loan loss, especially in the event of collateral liquidation and either unexpected asset devaluation or obsolescence. Because the credit reserve models in this study are based on the assumption of imperfect capital markets, asset illiquidity has been incorporated into the credit reserve expressions. Therefore, the transaction costs incurred in the event of default, including the liquidation of collateral, have already been taken into consideration when determining the firm's credit reserve.

Stiglitz and Weiss show that by requiring borrowers to increase the required equity investment in a financed asset the bank in fact can introduce an adverse selection effect similar to that which results by increasing collateral requirements. This issue was discussed with regard to collateral policy in section 7.4.4.

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7.7 Base Model With Increased Price and Yield Risk

7.7.1 Data Assumptions and Deterministic Parameters for the Firm and Lenders

The sixth model, the Base Run Model With Increased Price and Yield Risk (BRM-IPYR), is similiar to the BRM Model in that it is based on the same economic assumptions and initial financial position of the firm. The BRM-IPYR Model differs from the BRM Model in that the potential for production risk has been increased by 50 percent. The standard deviation expressions in the corn and soybean price equations, together with the standard deviation expressions for

Table 7-28 Commodity Price and Yield Risk Parameters

PRODUCTION RISK VARIABLE	MODEL	
	BRM	BRM-IPYR
Commodity Prices- Standard Deviation		
Corn	.102	.153
Soybeans	.06800001	.10200002
Percent Change	50.0	50.0
Crop Yields- Standard Deviation		
Corn	.25	.375
Soybean	.25	.375
Percent Change	50.0	50.0

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the corn and soybean yield equations, were increased 50 percent from the BRM model. Table 7-28 summarizes the changes in the standard deviation expressions for both prices and yields.

7.7.2 Analysis of Cash Flow Results

While the BRM-IPYR model experienced a deficit net cash flow in three of the five years, the BRM-IPYR model deficits were minor compared to the deficits realized in the RBRM, BRM and BRM-IRP models. Table 7-29 summarizes the five-year Cash Flow Summary for the BRM-IPYR model.

For the five-year period, the average net cash flow was 52,436 dollars, 6,877 dollars more than realized by the BRM model. While the coefficient of variation was 2.12 for the BRM-IPYR model, this result is misleading in that three of the years the firm experienced a deficit net cash flow and in the fourth year the firm had a 47,817 dollar net cash flow. The first year's net cash flow of 245,912 dollars is the primary factor in explaining the overall favorable results of the BRM-IPYR model when compared to the other models.

The BRM-IPYR firm received other farm income in four of the five years, 1989-1992, as a result of the large cash reserves maintained by the model as a strategy in response to the increased production and price risk.

The model selected the firm's initial GAMMA ratio in three of the five years, 1989-1991, thus recommending the

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purchase of required machinery only in those years. In 1988, the model selected the maximum GAMMA ratio permitted in the model, 40.0 percent. This action resulted in the purchase of 128,220 dollars of machinery. The model generated a 25.9 percent rate of return on total assets during the planning phase, while the model simulated a 39.65 percent rate of return as a result of the 228 bushel corn yield and 50 bushel soybean yield.

In 1992, the optimal debt recommendation was to cash rent an additional 135 acres and purchase a machinery component of 111,831 dollars. This action resulted in a 6.34 percent rate of return to total assets and a (112) dollar net cash flow for the period.

Cash Flow Summary Report: 1988-1992

Cash Category	1988	1989	1990	1991	1992

Cash Category	1988	1989	1990	1991	1992
SOURCES OF CASH					
Cash Receipts From Oper.	$ 738,258	$ 299,147	$ 427,610	$ 299,605	$ 504,297
Other Farm Income	0	19,513	9,045	36,668	7,007
Capital Asset Sales	0	0	0	0	0
Non-Farm Income	20,000	21,000	22,050	23,150	24,300
New Intermed. & LT Debt	129,600	39,556	39,446	39,059	128,240
TOTAL CASH AVAILABLE:	$ 887,858	$ 379,217	$ 498,153	$ 397,383	$ 663,845
USES OF CASH					
Total Cash Oper. Expenses	$ 216,453	$ 223,741	$ 241,016	$ 265,890	$ 337,138
Capital Asset Purchase	162,000	49,445	49,308	48,824	160,300
Intermed. and LT P&I Pmts	92,160	90,908	85,344	82,955	105,976
Taxes & Social Security	146,333	3,726	49,667	0	35,542
Family Living Withdrawal	20,000	15,978	20,000	16,568	20,000
Non-Farm Cash Withdrawal	5,000	5,000	5,000	5,000	5,000
Asset Liquidation Expenses	0	0	0	0	0
TOTAL CASH REQUIRED:	$ 641,946	$ 388,799	$ 450,336	$ 419,238	$ 663,957
NET CASH FLOW (DEFICIT):	$ 245,912	$ (9,582)	$ 47,817	$ (21,855)	$ (112)
FORCED ASSET LIQUIDATION:	$0	$0	$0	$0	$0
CASH FLOW EXPOSURE TO:					
Exhaust Restricted Credit	$ 580,128	$ 895,358	$ 804,472	$1,043,607	$ 599,556
Result in Bankruptcy	$ 762,707	$1,123,131	$1,059,109	$1,295,474	$ 791,686

Cash Flow Summary Report: 1988-1992

Table 7-29 Base Run Model With Increased Production and Price Risk-Cash Flow Summary: 1988-1992

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7.7.3 Year-End Net Worth Position and Measures of Performance

Table 7-30 summarizes the BRM-IPYR model's consolidated balance sheet, restricted credit reserve summary and selected financial measures for the 1988-1992 period. The firm experienced a 367,418 dollar increase in real estate capital gains in 1989. This was a result of the 228 bushel corn and 50 bushel soybean yields in 1988, which generated a 359 dollar net income per acre in 1988. Of the six models examined, the BRM-IPYR model ranked first for the largest first year increase in real estate appreciation. Over the five-year period the firm's real estate increased a total of 481,707 dollars, averaging 96,341 dollars per year with a standard deviation of 406,373 dollars.

The BRM-IPYR model's net worth increased an average of 105,158 dollars per year. With regard to the average annual change in net worth, the BRM-IPYR model ranked third, behind the BRM-IRP and BRM models, but ranked first for the largest standard deviation of change in net worth.

Over the five-year period the BRM-IPYR model had an end-of-year GAMMA ratio that ranged between 28.138 percent in 1987 and 11.70 percent in 1991. After the firm realized the 570,482 dollar decline in real estate capital gain in 1992, the GAMMA ratio increased to 20.5 percent on December 31, 1992. In 1988, the optimal debt search routine recommended the maximum GAMMA ratio, 40.0 percentμ this was the only time the maximum GAMMA was selected during this study.

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As a result of the significant increase in the firm's real estate valuation in both 1989 and 1990, the optimal GAMMA ratio declined to 15.7 percent by 1990.

The BRM-IPYR firm's liquidity position, as measured by the current ratio, increased significantly in 1988, reflecting the 245,912 dollar net cash flow. The current ratio increased from 1.56:1 in 1987 to 6.48:1 in 1990. While the firm's liquidity declined in 1991 and 1992, as of December 31, 1992 the BRM-IPYR model had the best internal liquidity reserve of the six models examined in this study.

The firm's total debt peaked on January 1, 1990 at 854,134 dollars with 441,009 dollars (51.6 percent) consisting of contingent tax on real estate and machinery capital gains. While the firm experienced a deficit cash flow in three of the five years, internal cash and available credit was used to balance the cash flow deficit.

Balance Sheet Summary Report: December 31, 1987-1992

Category	1987	1988	1989	1990	1991	1992

Balance Sheet Summary Report: December 31, 1987-1992						
Category	1987	1988	1989	1990	1991	1992
ASSETS						
Current Assets	$ 119,000	$ 296,012	$ 276,485	$ 308,165	$ 276,491	$ 244,263
Machinery	270,000	379,287	376,428	373,808	371,092	466,246
Real Estate	540,000	907,418	1,357,267	1,565,727	1,592,189	1,021,707
Total Owned Assets	$ 929,000	$1,582,717	$2,010,181	$2,247,700	$2,239,772	$1,732,217
Value Rental Acreage . . .	540,000	907,418	1,357,267	1,565,727	1,592,189	1,251,591
Total Owned & Rented Assets	$1,469,000	$2,490,134	$3,367,448	$3,813,428	$3,831,961	$2,983,808
LIABILITIES and NET WORTH						
Current Liabilities . . .	$ 76,500	$ 56,361	$ 54,987	$ 47,566	$ 46,517	$ 59,898
Intermediate Liabilities	81,599	149,929	144,471	143,062	138,232	194,900
Long Term Liabilities . .	187,500	322,252	296,196	559,666	318,895	368,227
Total Liabilities	$ 345,599	$ 528,542	$ 495,654	$ 750,294	$ 503,644	$ 623,025
Net Worth	$ 583,401	$1,054,174	$1,514,527	$1,497,407	$1,736,128	$1,109,191
Machinery to Land Ratio . . .	25.00%	20.90%	13.90%	11.90%	11.70%	20.50%
Change in Real Estate Value .	NA	$ 367,418	$ 449,849	$ 208,460	$ 26,462	$ (570,482)
Change in Total Debt	NA	$ 182,943	$ (32,888)	$ 254,640	$ (246,650)	$ 122,381
Change in Net Worth	NA	$ 470,773	$ 460,353	$ (17,120)	$ 238,721	$ (626,937)
RESTRICTED CREDIT RESERVES						
Current	$ 251,409	$ 415,785	$1,241,429	$1,427,848	$1,277,607	$1,124,313
Intermediate	373,785	440,908	381,956	390,479	396,731	404,001
Long Term	630,000	467,631	2,308,410	2,745,636	2,817,849	1,695,213
Weighted	$ 942,694	$ 935,256	$2,914,191	$2,615,979	$3,382,791	$2,044,382

Table 7-30 Base Run Model With Increased Production and Price Risk-Year End Balance Sheet: 1987-1992

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Table 7-31 presents selected operations and financial statistics for the BRM-IPYR model. In particular, the actual price and yield data illustrates the impact of the increased price and production risk on the firm. For example, in 1988, the firm's corn yield was 228 bushels, while in 1990 it was 176 bushels. In contrast, in 1989 and 1991, the firm's corn yield was less than 100 bushels per acre. Soybeans produced similar yield swings equalling or exceeding 50 bushels per acre in 1988 and 1990 and triggering an All-Risk Insurance payment in both 1989 and 1991, when the yields declined to 24 and 22 bushels, respectively.

Total cropland remained at the initial endowment of 1,200 acres through 1991, before increasing to 1,135 acres in 1992 with the addition of 135 acres of rental land. That the model's optimal debt strategies through 1991 excluded adding additional land and the required machinery component is consistent with the expected reaction to the increased price and production risk. The optimal debt strategy maintained the firm's need for liquidity to react to deficit cash flow outcomes.

Category	1988	1989	1990	1991	1992	Operations and Financial Summary Report: 1988-1992

Operations and Financial Summary Report: 1988-1992					
Category	1988	1989	1990	1991	1992
FINANCIAL					
Value of Farm Production/Acre	$ 615.22	$ 265.55	$ 363.88	$ 280.23	$ 262.62
Cost of Production/Acre. . . .	256.06	262.12	272.73	292.19	282.54
Net Income After Tax/Acre. . .	$ 359.16	$ 3.43	$ 91.15	$ (11.96)	$ (19.92)
Real Estate Value Per Acre . .	$1,512	$2,262	$2,610	$2,654	$1,703
After Tax Return-Total Assets	39.645	4.03%	7.67%	2.96%	6.34%
IRR on Net Worth-Year to Year	80.70%	43.67%	(1.13)%	15.94%	(36.11)%
IRR on Net Worth-Annualized	80.70%	61.12%	36.92%	31.34%	13.71%
CROP PRICES & YIELDS					
Corn - Trend Yield (bu) . .	125	127	128	149	141
- Planning Yield (bu) .	154	46	28	50	99
- Actual Yield (bu) . .	228	93	176	90	118
- Planning Price. . . .	$2.86	$2.99	$3.12	$2.85	$2.72
- Actual Price	$3.32	$2.86	$1.89	$3.36	$3.05
Soybeans- Trend Yield (bu) . .	41	42	42	46	41
- Planning Yield (bu) .	37	46	19	30	13
- Actual Yield (bu) . .	50	24	53	22	44
- Planning Price. . . .	$10.25	$9.98	$9.23	$8.49	$8.53
- Actual Price	$10.45	$9.63	$7.01	$8.87	$8.94
CROP ACREAGE					
Owned Acres	600	600	600	600	600
Rental Acres	600	600	600	600	735
Corn Acreage	480	480	480	480	534
Soybean Acreage	720	720	720	720	801

Table 7-31 Base Run Model With Increased Production and Price Risk-Operations and Financial Report: 1988-1992

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7.7.4 Summary

The firm in the BRM-IPYR model experienced a very volatile rate of growth in net worth (wealth) over the five-year period, second only to the volatility of the RBRM model. Table 7-31 summarizes the two measures of return to the firm's net worth -- the year-to-year Internal Rate of Return (IRR), and the initial year through the current year annualized IRR. The firm realized an average year-to-year IRR of 20.61 percent, with the 1988 year-to-year IRR over 80 percent, and a (36.11) percent in 1992. This extreme variation in earnings is characteristic of the increased volatility of crop farms in general that do not attempt t0 manage production and price risk.

The five-year IRR for the BRM-IRP model was 13.71 percent. While the BRM-IPYR model's five-year IRR ranks third out of the six scenarios analyzed, if this model was rerun, the financial results would likely be quite different.

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7.8 Summary and Conclusions

Having discussed the assumptions and analyzed the results for each of the six scenarios presented in this chapter, this section examines how the results from each of the scenarios compared to each other with regard to several selected financial performance measures. Table 7-32 presents the first measure, a five-year Internal Rate of Return (IRR) to the decision maker's after-tax net worth (wealth) position. In addition, Table 7-32 summarizes the total dollar change to the decision maker's net worth, and the coefficient of variation for change in net worth over the five year planning period for each of the six scenarios.

Table 7-32 Internal Rate of Return to Net Worth, Total Change in Net Worth and Coefficient of Variation

MODEL	IRR	TOTAL CHANGE IN NET WORTH	COEF. OF VARIATION
	(percent)	(dollars)	
BRM-IRP	17.71	721,231	0.86
BRM	17.46	712,783	0.76
BRM-IPYR . . .	13.71	525,790	4.33
BRM-INIR . . .	13.58	519,441	1.35
BRM-ICR	9.29	326,428	2.54
RBRM	(1.23)	(34,918)	45.28

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The five-year IRR results for each scenario are presented in Table 7-32 ranked from highest to lowest result. Examination of the IRR results reveals that the six scenarios can be grouped into four subgroupings: the BRM-IRP and BRM models with IRRs over 17 percent, the BRM-IPYR and BRM-INIR models with IRRs over 13.5 percent, but 22.4 percent less than the first grouping, the BRM-ICR model with an IRR of 9.29 percent (47 and 32 percent less than the first and second grouping respectively), and the RBRM model which had a negative IRR for the five year period.

Despite the fact that the BRM-IRP model had the highest five-year IRR, the BRM model, with the second best IRR, had the smallest coefficient of variation. This result reflects the fact the BRM model experienced relatively stable year-to-year growth in net worth compared to the BRM-IRP model.

While the BRM-IPYR model had the third best IRR, the BRM-IPYR model's coefficient of variation ranked fifth. The coefficient of variation result reflects increased year-to-year variability to the decision maker's net worth that was the result of the increased standard deviation to the firm's stochastic commodity yields and prices.

Finally, the RBRM model, which realized a negative IRR for the five year planning period, also had the largest coefficient of variation. The increased year-to-year variability to the decision maker's wealth position, resulted from the total absence of use of production and price risk management strategies.

Table 4: Financial variables of the firm's standard model and BRM-IRP model

Variables	The firm's standard model	The BRM-IRP model
Asset	184,450	184,450
Debt	92,225	92,225
Equity	92,225	92,225
Debt ratio	50%	50%
Interest rate	7%	7%
Tax rate	40%	40%
Sales	184,450	184,450
Operating cost	147,560	147,560
Depreciation	18,445	18,445
Interest	6,456	6,456
Profit before tax	12,029	12,029
Tax	4,812	4,812
Profit after tax	7,217	7,217
Return on asset	3.91%	3.91%
Return on equity	7.83%	7.83%
Profit margin	3.91%	3.91%
Asset turnover	1	1
Equity multiplier	2	2
Dividend payout ratio	0%	0%
Retained earnings	7,217	7,217
Sustainable growth rate	7.83%	7.83%
Maintainable growth rate	7.83%	7.83%
Sales increase	14,756	14,756
Asset increase	14,756	14,756
Debt increase	7,378	7,378
Equity increase	7,378	7,378
Retained earnings increase	577	577
Dividend increase	6,801	6,801
Profit before tax increase	962	962
Tax increase	385	385
Profit after tax increase	577	577
Operating cost increase	11,805	11,805
Depreciation increase	1,476	1,476
Interest increase	516	516
Maintainable growth rate	7.83%	7.83%

Table 7-33 presents several additional measures of financial performance including the firm's current ratio as of the end of the planning period (the ratio between the firm's total current assets and total current liabilities), the five-year total net cash flow and the coefficent of variation for the net cash flow.

As suggested by the theory presented in chapters three and four, the BRM-IPYR model, the model with the increased standard deviation for both production and price risk, maintained the highest liquidity position. This high degree of internal liquidity represents a defensive strategy by the firm as a means to respond to deficit cash flow outcomes. The BRM-IPYR model had the highest current ratio in four of the five years, and ranked second to the RBRM model in the fifth year. With the exception of the one year, the RBRM model consistently ranked second to the BRM-IPYR model for maintaining the highest internal liquidity.

Finally, the BRM-IRP model which realized the highest return to the decision makers wealth over the five-year period, consistently maintained the lowest liquidity position, as measured by the firm's current ratio.

With regard to the model that produced the largest total after-tax net cash flow for the five-year period, the BRM-IPYR model ranked first with 262,180 dollars. The BRM-IRP model which ranked as the top model for growth in wealth, ranked fourth for total after-tax net cash flow with 184,490 dollars, 77,690 dollars (29.6 percent) less than the

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BRM-IPYR model. This apparent inconsistency between the BRM-IRP and BRM-IPYR model results can be explained by the fact that the total change in wealth (net worth) for which the BRM-IRP model ranked first, consists of two components-- net cash return and net capital gains. While total net cash flow for which the BRM-IPYR model ranked first, contains only the cash component of the firm's total rate of return.

Table 7-33 Selected Financial Measures

MODEL	CURRENT RATIO 12-31-92	TOTAL NET CASH FLOW	COEF. OF VARIATION
		(dollars)	
BRM-IPYR . . .	4.08:1	262,180	2.12
BRM	1.52:1	227,795	1.91
BRM-INIR . . .	1.70:1	219,388	1.86
BRM-IRP	2.90:1	184,490	2.23
BRM-ICR	1.38:1	67,280	3.61
RBRM	4.00:1	(40,990)	13.43

Of the six models, the BRM-IPYR model had the largest total after-tax net cash flow. However, this outcome was due primarily to the 245,912 dollar net cash flow realized by the firm in year one. This first year performance proved to be large enough to offset cash flow losses in three of the remaining four years and still result in the BRM-IPYR model having the largest total after-tax net cash flow. One consequence of the BRM-IPYR model's overall poor net cash income

per tillable acre was a 444 dollar difference between the BRM-IPYR and the BRM-IRP model's average value per tillable acre at the end of the five year planning period.

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CHAPTER 8

SUMMARY AND CONCLUSIONS

8.1 Review of the Theory and Underlying Assumptions

Management of a firm's credit reserve and evaluation of its impact on the firm's financial, capital investment and operational decisions take on increased importance during periods of increased financial stress. Because a firm's credit reserve is an intangible resource, it is influenced significantly by exogenous factors such as the lender's credit policies and general economic conditions. As a result, evaluation and management of a firm's credit reserve is a difficult task, made even more so when the firm is facing financial stress.

This study was undertaken in response to the need for an expanded theoretical understanding of financial management by proprietary firms under risk. The study presents three rigorously defined analytic investment models which explore in detail the complex interrelationships between a firm's credit reserves, the firm's borrowing behavior under conditions of financial stress, and capital investment under imperfect capital market conditions. The decision maker seeks an optimal level of debt that maximizes his expected

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utility of end-of-period wealth. A cash flow constraint and the probability of bankruptcy are incorporated into the decision maker's objective function.

Because of the mathematical complexities introduced when financial risk is incorporated into a model, the first two models were based on several simplifying assumptions, including: the firm has one category of risky assets and one category of debt, the firm's assets are divisible durables, and they last beyond a single period. Further, it is assumed that assets can be purchased and sold in any quantity under conditions of imperfect capital markets. The assumption of imperfect capital markets introduces the potential for asset illiquidity and thus asset liquidation costs. Introduction of imperfect capital markets introduces a liquidity premium variable, that differentiates between an asset's acquisition price and sale price.

The liquidity premium variable is incorporated into the financial leverage ratio, which is used to determine the firm's credit reserve. The modified leverage ratio restricts the total debt available to the firm, relative to the maximum debt that would be available under the assumption of perfect capital markets. The theoretical maximum credit reserve expression permits the firm to borrow up to the point where the liquidated value of its assets equals the firm's outstanding debt.

Departing from earlier research studies of credit reserve management that assumed the probability of

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bankruptcy to be zero, this study incorporates this possibility. The probability of involuntary bankruptcy is incorporated into the model by defining a new outcome point, which, if realized, results in a 'declaration of bankruptcy' and subsequent loss of 100 percent of the firm's equity.

This study employs a modified cash flow analysis technique for evaluating alternative firm-specific activities such as production, capital investment, credit usage, and risk management. The cash flow constraint requires the firm to meet its financial obligations relative to the stochastic net return earned on the firm's risky assets. In this model, financial obligations include interest payments on debt and cash withdrawals for family living expenditures and non-farm use. Inclusion of the cash flow constraint provides for only two operational outcomes based on the return on risky assets -- either a positive or negative net cash flow result. With a positive cash flow result, the firm services its debt commitments successfully and provides for family consumption. A negative cash flow result, however, results in the need for either additional borrowing from the firm's credit reserve or, in the event the firm's credit reserve has been exhausted, the partial liquidation of assets to balance the cash flow deficit.

Comparative static results for the first model show that the firm's bankruptcy outcome point, is positively related to changes in cash withdrawals, the liquidity premium, and to the cost of borrowing, and inversely related

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to changes in expected returns on assets and equity. Moreover, the comparative static analysis reveals an ambiguous relationship between the critical bankruptcy point and both debt and new asset purchases.

An important feature of the first model is the interaction between the stochastic earnings of the firm and the total credit extended by the lender. By requiring that the firm's cash flow be balanced at the end of each production period, the firm's credit reserve serves as its primary source of liquidity and is recalculated at the end of the production period to reflect the firm's financial performance for the period. Thus, the first model captures a feature required for modeling a firm's borrowing behavior. Finally, Model I demonstrates that as financial stress increases under the assumption of imperfect capital markets, a firm's credit reserve becomes increasingly important as a response to financial and business risk.

The concept of a restricted credit reserve exhaustion point, is introduced in Model II. The restricted credit reserve exhaustion point results when the lender imposes a further restricted leverage ratio on the firm. Inclusion of the restricted leverage ratio enables the firm's lender to differentiate between the impact of two variables, the liquidity premium, and a credit policy variable. Introduction of the credit policy variable results in a second critical outcome point on the probability density function distribution for the stochastic variable.

With the firm's cash flow problems, the bank's refusal to grant additional credit is the consequence.

A hypothesis test is the preferred statistical procedure for factory managers.

Whether the increase in overhead costs will actually threaten the long-term profitability of the company is the subject of a study by the financial analysts.

The board of directors decided to increase the dividend payout ratio.

With the introduction of the restricted credit reserve, the firm must approach operational and investment decisions with the knowledge that it must not only deal with a 'declaration of bankruptcy' point but also a credit reserve 'exhaustion' point. Management must now consider the economic consequences of forced asset liquidation in the event of a cash flow deficit and credit exhaustion.

A significant result obtained by using the second model is the empirical verification of Robison and Lev's risk preference reversal hypothesis. The Robison and Lev hypothesis states that a risk-averse investor is willing to incur greater financial risk when his firm's survival is threatened. Increasing financial leverage further compacts the left hand tail of the probability density function for stochastic outcomes, thereby increasing the expected return and reducing the variance from investments in risky assets. The borrower's optimal debt position increases as the probability of bankruptcy increases. These effects result in increased probability of bankruptcy, while providing the decision maker with the incentive to use increased leverage.

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8.2 The Simulation Model and a Summary of the Numerical Results

8.2.1 Computer Simulation Model

Model III, the simulation model, is consistent with the assumptions and theoretical relationships of the first two deductive investment models. It, however, expands on the first two models by incorporating production, marketing and risk management strategies for a typical midwest cash grain farm. The computer model provides for categorizing assets and liabilities into three groups -- current, intermediate, and long term. In conjunction with this grouping of the balance sheet categories, measurement of the firm's credit reserve is expanded to include eight credit reserve calculations, including a maximum and restricted credit reserve calculation for each asset category and an integrated maximum and restricted credit reserve expression for the firm as a whole.

In addition to the expanded financial accounting capabilities, the simulation model provides for two crop enterprises, corn and soybeans, and permits the decision maker to select the crop mix. Crop land in the model can be both owned and cash rented.

Further, the simulation model provides the decision maker with the capability to manage both price and yield risk. Management of production risk is incorporated into the model through the option to purchase All-Risk Crop Insurance, while management of commodity price risk is

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provided for by incorporating the option to forward contract commodities.

While the model provides complete flexibility for establishing family size, family consumption and the demand for non-farm cash withdrawals, this study assumes a four-person family unit, with stated minimum and maximum annual consumption, along with planned consumption based on a two-year moving average family consumption pattern. In addition, the model provides for both non-farm income and non-farm cash withdrawal as a source and use of cash.

The firm's lenders offer one-year fixed interest rate loans which can be changed annually. The model's other credit variables, including the liquidity premium for each asset category, the credit policy variable for each class of debt, the required cash down payment percentages for asset purchases, and the amortization term for each category of debt can be changed annually and are adjusted according to the assumptions of the particular scenario being evaluated.

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8.2.2 Summary of the Numerical Results

The study includes the simulation and analysis of six scenarios. These include a restricted version of the Base Run Model (RBRM), a Base Run Model with All-Risk Crop Insurance and marketing strategies (BRM), the Base Run Model with increasing collateral requirements (BRM-ICR), the Base Run Model with increasing nominal interest rates (BRM-INIR), the Base Run Model with an incentive interest rate program (BRM-IRP), and the Base Run Model with increased yield and price risk (BRM-IPYR).

The Restricted Base Run Model (RBRM) involved the same macro economic and firm-specific assumptions as the Base Run Model (BRM). However, the computer model's recommended optimal debt solutions and thus investment/disinvestment recommendations were not followed in the RBRM scenario. Further, All-Risk Crop Insurance and forward contracting of grain were not options with the RBRM scenario. Thus, the RBRM scenario serves as the 'naive management' baseline scenario, the decision maker does not attempt to manage either price or production risk. Furthermore, the RBRM firm's operations are based on the assumptions of stable year-to-year capital investment and maintenance of productive capability and total crop land.

For the five-year simulated planning period, the decision maker under the RBRM assumptions experienced a loss to his wealth position. In addition to the loss of net worth, the RBRM scenario also experienced the largest year-to-year

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variability in change in net worth, as measured by the coefficient of variation, of the six scenarios evaluated.

In the Base Run Model (BRM), the All-Risk Crop Insurance and forward contracting of grain options were used as means for managing production and price risk. In the BRM scenario, as well as in the remaining four scenarios, the computer simulation model's optimal debt solutions (and thus recommendations with regard to investment/disinvestment of assets) were selected for each of the planning periods. While the BRM scenario ranked second to the BRM-IRP scenario for the best five-year internal rate of return (IRR) to the decision maker's wealth position, the BRM scenario did experience the most stable year-to-year change in net worth of the six scenarios examined.

The Base Run Model With Incentive Interest Rate Program (BRM-IRP) was the scenario that maximized the decision maker's after-tax wealth position over the five-year simulation period. The combination of interest rate concessions to the borrower in exchange for increased equity investment in assets being financed and reduced amortization periods for intermediate and long term debt produced the second most stable year-to-year change in wealth position. The BRM-IRP model ranked fourth out of the six scenarios with regard to both average net cash flow per year and year-to-year stability of net cash flow.

The Base Run Model With Increasing Collateral Requirements (BRM-ICR) experienced increased financial risk through

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reduced credit reserve availability. Reduced availability of intermediate and real estate credit restricted the firm's ability to respond to production growth opportunities. The firm in the BRM-ICR scenario experienced increased net cash flow variability and reduced growth in net worth relative to the BRM scenario. Unless all creditors in a geographic area adopt similar restrictive credit policies, decision makers have an economic incentive to bypass restrictive lenders and seek alternative sources of debt capital to take advantage of available growth opportunities.

The Base Run Model With Increasing Nominal Interest Rates (BRM-INIR) exposed the firm to increasing costs of debt capital. Over the five-year period the firm experienced a ten percent annual increase in nominal interest rates. Despite the increased cost of debt capital the BRM-INIR firm experienced the most stable annual net cash flow of the six scenarios, however, the BRM-INIR scenario's five-year IRR to the decision maker's wealth position is 23.3 percent less than the 17.71 percent for the top ranked BRM-IRP model. As a result, total change in wealth position for the BRM-INIR scenario is 201,790 dollars less than for the BRM-IRP model.

Despite an increase of more than 50 percent in the cost of debt capital over the five-year period, the computer model recommended the purchase of 968,170 dollars of machinery and the rental of an additional 534 acres as a means of improving the firm's profitability and thereby

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maximization of the decision maker's end-of-period wealth position.

The Base Run Model With Increasing Price and Yield Risk (BRM-IPYR) generated a total change in net worth that ranked third behind the BRM and BRM-IRP scenarios. Despite the favorable increase in total net worth, the BRM-IPYR model had the most volatile annual change to net worth of the five versions of the BRM model evaluated, and ranked second in net worth volatility to the RBRM model.

As expected, the BRM-IPYR model produced the largest crop price and yield variance of the six scenarios examined. In response to the increased yield and price risk the BRM-IPYR model recommended maintaining the firm's acreage base at the initial 1,200 acres for the first four years, before recommending an increase of 135 rental acres in year five. In response to increased price and yield variability, and subsequently the potential for year-end deficit cash flows, the BRM-IPYR model maintained the highest level of internal liquidity of the six scenarios evaluated.

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8.3 Implications for Users of the Model

8.3.1 Implications for Lenders and Agricultural Policy Makers

The simulation model developed in this study provides an effective and efficient means for evaluating increasingly complex and integrated financial, production and marketing alternatives under uncertainty. The operational and financial results for the six scenarios evaluated in this study highlight the financial implications of decision making under uncertainty for both agricultural producers and lenders.

Bankers could utilize the computer model as a tool for simulating the potential operational and financial implications for their crop producing borrowers that would result from changes in existing credit policies. Further, the model could be used to evaluate the potential economic impact of new credit programs on a bank's operational performance and loan portfolio quality before implementation. For example, before implementation of tighter collateral requirements, bank management could simulate the economic impact of the proposed changes on various aspects of both the bank's financial performance and that of the bank's corn/soybean borrowers.

With regard to agricultural policy, at the micro level, the model could serve as a useful tool for evaluating the financial performance of corn and soybean producers under a wide range of financial, production and policy assumptions.

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For example, currently agricultural policy makers are emphasizing reduced government involvment with commodity price and acreage controls. With limited refinement, the computer model could be used to evaluate the economic consequences of changing the various United States Department of Agriculture production and payment programs on corn and soybean producers.

Finally, with the incorporation of the Robison and Burghardt land valuation models in the credit reserve management model, policy makers could evaluate potential tax law changes, such as reinstatement of the capital gain tax or changes in the marginal tax rates, on the financial well being of corn and soybean producers.

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8.3.2 Implications for Borrowers and Students

Use of the computer model as a teaching tool in farm management courses and cooperative extension meetings would enable university students and farmers alike to operationalize and study interrelationships between the various financial, production, marketing and risk management techniques required by decision makers faced with making decisions under uncertainty. Management of a firm's credit reserve and evaluation of its impact on the firm's financial, capital investment and operational decisions takes on increased importance during periods of increased financial stress. Therefore, successful management of a firm's credit reserve can often mean the difference between success or failure.

A review of the financial results for the six scenarios presented in chapter seven highlights the usefulness of the computer model for evaluating increasingly complex business decisions. The six scenarios presented are not meant to be exhaustive, rather, they only begin to highlight the range of economic assumptions and financial positions that may be evaluated by the computer model.

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8.4 Limitations and Future Research Issues

8.4.1 Farm Level Research Issues

No simulation model is complete in every way, additional features to broaden its usefulness can always be added. Because simulation models are abstractions of reality, simplifing assumptions must be made during development. As additional features are added, the realism of the model is enriched and the range of possible extension and research applications is broadened.

A computer simulation model such as this provides an excellent pedagogical tool for integrating the complexities of decision making under uncertainty with the latest advances in financial and economic theory, such as expected utility theory and integrated risk management techniques. Future research could usefully focus on enriching the simulation model by adding the following features:

-- Provide for management of grain inventories

-- Provide for financial leasing of field equipment and structures

-- Differentiate between buildings, grain drying equipment and field machinery

-- Expand the number of commodity marketing options

-- Relax assumptions regarding fixed asset acquisition, liquidation and depreciation

-- Provide for additional enterprises

-- Provide for additional asset categories and more detail within individual asset categories

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-- Provide for additional loan programs and policies, amortization terms, and the number of loans the computer program can manage

-- Provide for non-cash rental of crop land

An expanded consideration of commodity marketing strategies for managing price risk could include factors such as commodity futures and on-farm and commercial grain storage. The addition of these additional marketing options, together with the options currently offered (including cash sale at harvest and forward contracting of grain) would expand the model's pedagogical usefulness in teaching how different commodity marketing strategies can be used to reduce farm-level commodity price volatility, while obtaining higher prices for producers. Rather than focusing strictly on marketing strategies, the model allows the user to integrate alternative marketing strategies with financial decisions and thereby evaluate their contribution to the firm's financial performance.

With regard to researching alternative financial management strategies, the model can be modified to simulate alternative credit policies and potential loan programs on firms with different resources. This would allow the user to evaluate the likely implications of such policies and programs on the bank's loan portfolio size and quality.

Clearly, the corn/soybean simulation model presented in this study could be enhanced further, in part through the addition of the various features mentioned here. More impor-

tantly, however, the theoretical structure of this model can serve as the basis for the development of specialized models for enterprises such as dairy, beef, and pork, among others.

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8.4.2 Credit Policy Research Issues

The credit variables and lender policies utilized in this 'producer' model are all exogeneous to the model. The firm's decision maker must obtain and input the various credit variables initially, and if adjusted by the lender during the planning process, the variables must be updated at the start of each subsequent period. Future credit policy research could include development of corresponding financial theory of the firm for the lender, as was developed for the firm in this study. For example, specification of the lender's objective function to maximize end-of-period stockholder wealth could involve integration of the various credit policy variables utilized in the producer model.

Credit policy variables could be incorporated into the lender model including interest rates, collateral requirements, and required equity investment in capital assets to be financed with debt capital. Producer-specific variables, such as the firm's financial condition, debt repayment capability, and evaluation and measurement of the firm's production and financial risk, would then be exogeneous to the lender model.

Maximization of the model's objective function would then provide a lender with credit policy recommendations, such as the optimal level of credit to advance various borrowers based on selected financial measures, the optimal interest rate structure, collateral policy and so forth. Further, integration of such a lender model with a producer

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model such as the one developed in this study could serve as the basis for development of a general equilibrium model for the supply and demand of credit for the agricultural sector.

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AN ECONOMIC ANALYSIS OF CREDIT RESERVE MANAGEMENT BY PROPRIETARY FIRMS UNDER UNCERTAINTY
Volume II

By

William George Burghardt

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1989

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APPENDICES

APPENDIX A

APPENDIX A

APPENDIX A

NAME	VARIABLE DEFINITION	ORIGIN
ACCDEP	Accumulated depreciation	1 C
ADJINC	Net farm and non-farm income before tax	4 C
ALPHA	Weight given to last year's family living	1 I
AO	Tillable acres owned at beginning of year	1 I
AR	Acres rented at beginning of year	1 I
ASSET.C	Market value of current assets	1 I
ASSET.I	Market value of intermed. assets	1 I
ASSET.L	Market value of real estate owned	1 I
ASSET.LR	Additional land cash rented this year	4 C
ASSET.LRT	Total rental land for this year (cycle)	1 C
ASSET.PLR	Rental land contracted prior to this year	1 I
ASSETP	Aggregate asset purchase search variable	4 C
ASSETP.IO	Mach. purchased to work addl purch land	4 C
ASSETP.IOI	Search variable for machinery in land pur	4 C
ASSETP.IR	Mach. required to maintain productive cap.	1 C
ASSETP.IRA	Mach. purchased to work addl rental land	4 C
ASSETP.LO	Tillable acreage purchased this cycle	4 C
ASSETP.LOI	Search variable for acreage purchase	4 C
ASSETP.L(par)	Individually numbered land parcel(s)	2 I
AVAILASS.C	Cash or cash equil. avail. for liquidity	2 C
AVAILASS.CI	Cash avail. for dp on requited mach. pur.	2 C
AVAILASS.CL	Avail. cash to a balance CRDRESR.L deficit	2 C
BAITC	Invest. tax credit avail. begin of year	1 I
BEHYC	Breakeven corn yield to consider harvest	4 C
BEHYS	Breakeven soy yield to consider harvest	4 C
BETA	Inverse of 1/(1+GAMMA1S.I)	4 C
BPA	Bushels per acre	2 I
CAP	Percent of total acreage planted to corn	3 C
CAPINV	Total capital investment this cycle	5 C
CASHDP.C	Cash downpayment % required: current	1 I
CASHDP.I	Cash downpayment % required: intermed.	1 I
CASHDP.L	Cash downpayment % required: long term	1 I
CASHOUT	Cash withdrawn from farm firm (non-living)	1 I
CBASET.L(par)	Cost basis of individually numbered parcels	1 I
CBBVG	Ratio of cost to book value for growth	1 C
CBBVM	Ratio of cost to book value for mainten.	1 C

CBMVG	Ratio of cost to market value for growth	1	C
CBMVM	Ratio of cost to mkt value for mainten.	1	C
CCGT.I	Contingent capital gains tax:inter. assets	1	C
CCGT.L	Contingent capital gains tax: real estate	1	C
CC1	Correlation coef. between crop yields	4	I
CC2	Correlation coef. between crop prices	4	I
CCVE	Corn cash variable expenses (1-12)	3	I
CFE(I)	Cash fixed expense categories (1-5)	3	I
CFXPC	Total cash flow exposure for corn acreage	3	C
CFXPS	Total cash flow exposure for soy acreage	3	C
CP.C	Portion of current liab. due this year	2	C
CP.I	Portion of intermed. liab. due this year	2	I
CP.L	Portion of long term liab. due this year	2	I
CRDRESM.C	Maximum credit reserve: current assets	2	C
CRDRESM.I	Maximum credit reserve: intermed. assets	2	C
CRDRESM.L	Maximum credit reserve: real estate	2	C
CRDRESM.W	Firm's maximum weighted credit reserve	2	C
CRDRESR.C	Restricted credit reserve: current assets	2	C
CRDRESR.I	Restricted credit reserve: intermed assets	2	C
CRDRESR.L	Restricted credit reserve: real estate	2	C
CRDRESR.W	Firm's weighted restricted credit reserve	2	C
CRNPR	Corn price input data array (1-10 cycles)	3	I
CROPEXP	Total corn and soy production expenses	5	C
CROPSALE	Total crop sales during current cycle	5	C
CRNPRTR	Corn price for this year (cycle)	3	I
CTCF	Cost factor when buying corn per bu.	4	I
CURRATIO	Ratio: current assets to current debt	2	C
CVE(I)	Cash variable expense categories (1-12)	3	I
CYCLE(S)	Number of simulation years (cycles)	1	I
CYLD	Expected corn yield for the next year	3	C
DBT.C	Current liabilities (due within 1 yr)	1	I
DBT.I	Intermediate liabilities	1	I
DBT.L	Long Term Liabilities	1	I
DBTRET	Total debt repaid during current cycle	5	C
DE.I	Debt to equity ratio:intermediate assets	2	C
DE.L	Debt to equity ratio:long term assets	2	C
DEL.C	Credit policy variable: dbt.c lender	1	I
DEL.I	Credit polisy variable: dbt.i lender	1	I
DEL.L	Credit policy variable: dbt.l lender	1	I
DEL.W	Weighted credit variable: all lenders	2	C
DEPRATE	Rate of depreciation per year	1	I
DEPREC	Depreciation expense for current year	5	C
E0	Rate of return resulting in bankruptcy	4	C
E1	Rate of return resulting in crdresr.w=0	4	C
E0COUNT	Ei occurance such that E0 < Ei < E1	4	C
E1COUNT	Ei occurance such that Ei >E1	4	C
E0SUM	Sum of the Ei's from E0COUNT	4	C
E1SUM	Sum of the Ei's from E1COUNT	4	C
EAITC	End of period invest. tax credit balance	4	C
EFAMLIVING	Expected family living for current year	1	I
EGMPAC	Estimated gross margin per acre corn	3	C

EGMPAS	Estimated gross margin per acre soybeans	3	C
EGRPAC	Estimated gross revenue per acre corn	3	C
EGRPAS	Estimated gross revenue per acre soybeans	3	C
EPC	Expected price per bu. corn	2	I
EPS	Expected price per bu. soybeans	2	I
EQTPOS.C	Equity position for current assets	2	C
EQTPOS.I	Equity pos. intermed asset w/out ccgt.i	2	C
EQTPOS.L	Equity pos. real estate w/out ccgt.l	2	C
EQTPOSM.C	Equity position for current assets	2	C
EQTPOSM.I	Equity pos. intermed. assets with ccgt.i	2	C
EQTPOSM.L	Equity pos. real estate with ccgt.l	2	C
EXEMP	**No. of family members claimed as depend.**	**1**	**I**
FAMLIV82	**Family living expenses for 1982**	**1**	**I**
FAMLIV83	**Family living expenses for 1983**	**1**	**I**
FCCP	**Percent of corn crop forwarded contract**	**3**	**I**
FSCP	Percent of soybean crop forwarded cont.	3	I
FLAVE	Family draw averaged for years T-1 and T-2	1	I
FORLIQ.I	Forced intermed. asset liquidation	5	C
FORLIQ.L	Forced real estate liquidation	5	C
GAMINC	GAMMAlS.I incrementation during optimiz.	1	I
GAMMAlS	Invest ratio between mach and total land	1	C
GAMMAlS.I	Search GAMMAlS for optimization routine	4	C
GMC	Gross margin from corn	4	C
GMS	Gross margin from soybeans	4	C
GYC	Guaranteed yield for insurance: corn	3	I
GYS	Guaranteed yield for insurance: soybeans	3	I
IN.C	Fixed interest rate charged on dbt.c	1	I
IN.I	Fixed interest rate charged on dbt.i	1	I
IN.L	Fixed interest rate charged on dbt.l	1	I
INCFRMOP	Income from farm operations before tax	5	C
INDBT.C	Annual interest charged on dbt.c	4	C
INDBT.I	Annual interest charged on dbt.i	4	C
INDBT.L	Annual interest charged on dbt.l	4	C
INFLA	Gen. rate of inflation index	1	I
INVEST.I	Required machinery investment this year	1	C
IPC	Indemnity price corn	3	I
IPS	Indemnity price soybeans	3	I
IPPC	Indemnity price percentage: corn	3	I
IPPS	Indemnity price percentage: soybeans	3	I
INSPA	Insurance costs per acre (fixed cost)	4	C
ITC	Invest. tax credit on new deprec. assets	4	C
LAMDA	Decision maker's risk aversion coefficient	1	C
LIQSHT	Liq. deficit given available parcel value	2	C
LPDBT.I	Intermed. liab. due beyond current year	1	I
LPDBT.L	Long term liab. due beyond current year	1	I
MAXASSETP.IS	Max mach. purchase during gamma search	4	C
MAXASSETP.IRC	Max mach. purchase based on avail cash	2	C
MAXASSETP.IRD	Max mach. purchase based on avail debt	2	C

MAXASSETP.IRA	Max mach. purchase based on constraints	2	C
MAXASSETP.TOC	Max m/e & r/e purchase based on cash dp	4	C
MAXASSETP.TOD	Max m/e & r/e purchase based on debt avail	4	C
MAXEM.W	Max operating loss going into bankruptcy	1	C
MAXER.W	Max oper loss before exhausting CRDRESR's	1	C
MAXINC	Maximum family living draw: current yr	1	I
MEBV	Machinery book value	1	I&C
MINCR.C	Min. credit reserve required: current	1	I
MINCR.I	Min. credit reserve required: intermed.	1	I
MINCR.L	Min. credit reserve required: long term	1	I
MININC	Minimum family living draw: current yr	1	I
MINRATIO.C	**Minimum current ratio set by lender**	**1**	**I**
MUS1$	**Music input variables**	**1**	**I**
NCF	**Net cash flow**		
NEWDBT	**Total new debt borrowed this cycle**	**4**	**C**
NIAT	Net income after tax	4	C
NIBT	Net income before tax	4	C
NONFINC	Non farm income	1	I
NRRA	Net return on the firm's assets at risk	4	C
NUMDEP	Number of dependents	1	I
OPTAP	Optimal total asset purchase	4	C
OPDBT	Optimal debt structure for the firm	4	C
OPTEU	Calculation of optimal expected utility	4	C
OTHERINC	Insur. pmts and interest on surplus cash	5	C
P0	Percentage of the Ei's below E0	4	C
P1	Percentage of the Ei's E0 < Ei < E1	4	C
P2	Percentage of the Ei's Ei > E1	4	C
PAL	No. of acres of land avail. for purchase	1	I
PCY	Previous corn yield (year)	3	I
PIPMT	Total int and prin. on capital debt	5	C
PPDDBT.C	Prepayment of current liability	4	I
PPDDBT.I	Prepayment of intermed. liability	4	I
PPDDBT.L	Prepayment of real estate liability	4	I
PPDDBT.T	Total prepayment of debt	4	C
PPDLEASE	Prepaid lease on rental acreage	2	C
PPPA	Purchase price per acre of additional land	1	I
PPRA	Market value per acre of rented land	1	I
PRBBKY	Probability of bankruptcy	4	C
PREMC	Insurance premium per acre: corn	3	I
PREMCNET	Net premium cost for corn acreage	3	C
PREMS	Insurance premium per acre: soybeans	3	I
PREMSNET	Net premium cost for soybean acreage	3	C
PROBC	Prob. of an insur. claim this year: corn	3	C
PROBS	Prob. of an insur. claim this year: soy	3	C
PSY	Previous soybean yield (year)	3	I
PUR.INC	Search variable for land purchase	1	I
PUR.PUR	Purchased asset increment from opt. rout.	4	C
PUR.STOP	Stopping condition during land pur search	1	I
PVOLLIQU.LO	Percentage of owned land to be sold	1	I
PVOLLIQU.LR	Percentage of rental land to be released	1	I

PVOLLIQU.T	Max % of assets that can be partially liq	1	I
QCC	Quantity of corn forward contracted (bu.)	2	I
QSC	Quant. of soybeans forward contracted (bu.)	2	I
RAL	No. of acres of addit. rental land avail.	1	I
RBAR	Ave. rate of return on production assets	4	C
REN.INC	Search increment for optimal rental land	1	I
RENTAC.ME	Max acres to rent based on ASSETP.IRA	4	C
RENTAC.DP	Max acres to rent based on cash dp	4	C
REFINANCE	Var. tracking the firm's refin. activity	1	I&C
REIR	Annual rate of growth in land values	1	I
REN.STOP	Stopping condition during rental search	1	I
REQASSET.CI	Mach to be sold to meet CRDRESR.I minimum	2	C
RFRR	Risk free return earned on surplus cash	1	I
RIS	**Total number of random draws**	**4**	**C**
ROWCOST	Total cost of liquidating assets	4	C
ROW.C	Liquidation premium: current assets	1	I
ROW.I	Liquidation premium: intermed. assets	1	I
ROW.L	Liquidation premium: real estate	1	I
ROW.WE0	Weighted liquid. premium: all assets	2	C
RRPA	Rental rate per acre	1	I
RSUM	Sum of the random returns to risky assets	4	C
SAP	Percent of total acres planted to soy	3	I
SASSET.IT	Mach inventory adjusted for gamma search	4	C
SCVE	Soybean cash variable expenses (1-12)	2	I
SDC	Standard deviation for corn yield per acre	2	I
SDS	Standard deviation for soy yield per acre	2	I
SDPRC	Standard deviation for corn price	2	I
SDPRS	Standard deviation for soybean price	2	I
SIN.W	Search routine weighted interest rate	4	C
SINDBT.T	Search routine total interest expense	4	C
SPAVAILASS.C	Temp. search var. for available cash dp	4	C
STCF	Cost factor for soybean purchase per bu.	1	I
STOPC	Stochastic price for corn	4	C
STOPS	Stochastic price for soybeans	4	C
STOYC	Stochastic yield corn	4	C
STOYS	Stochastic yield soybeans	4	C
SUMCB.L	Value of total land owned:cost basis	2	I
SUMCFE	Total cash fixed expenses less interest	2	C
SUMCCVE	Total variable expenses per acre: corn	2	C
SUMMINCR	Sum of the minimum credit reserves	4	C
SUMSCVE	Total variable expenses per acre: soybeans	2	C
SUMMV.L	Value of total land owned:market value	2	C
SUMRED	The % of lowest parcel no. already liquid.	2	C
SYBPRYR	Soybean price for this year (cycle)	2	I
SYBPR	Soybean price input array (1-10 cycles)	2	I
TAO	Total acres owned during current year	3	C
TAR	Total acres rented during current year	3	C
TASSET.C	Total current assets	1	I
TASSET.CB	Total owned assets at modified cost	1	I

TASSETLIQ	Total assets sold excluding forced liq.	5	C
TASSETS.M	Total owned assets at market value	1	I
TASSETS.TA	Total assets (owned and rented) mkt value	1	I
TAX	Federal tax owed before tax credits	4	C
TAX83	Firm's 1983 federal tax rate	1	I
TAXINC	Total taxable income for the cycle	4	C
TAXPA	Real estate tax per acre	4	C
TAXRATE	Tax rate determined by taxable income	5	C
TCA	Total cash available	5	C
TCEXP	Total cash expenses	5	C
TCFE(I)	Total fixed costs after optimization	4	C
TDBT.C	Total current liabilities	1	I
TDBT.I	Total intermediate liabilities	1	I
TDBT.L	Total long term liabilities	1	I
TDBT.CB	Sum of TDBT.C+LPDBT.I+LPDBT.L	2	C
TDBT.M	**Sum of TDBT.C+TDBT.I+TDBT.L**	**2**	**C**
TEMASSET.L	Temporary mkt value account for land	2	C
TEQTPOS.CB	Modified cost equity pos. of the firm	2	C
TEQTPOS.M	Market value equity pos. of the firm	2	C
TERM.C	Term for the firm's current liabilities	1	I
TERM.I	Term for the firm's intermed. liab.	1	I
TERM.L	Term for the firm's long term liab.	1	I
TLABOR	Total cash labor expense for the year	5	C
TLANDTXINS	Total land taxes and insurance expenses	5	C
TMCC	Three year trim mean for corn yields	4	C
TMCS	Three year trim mean for soybean yields	4	C
TMISCELL	Total miscellaneous expenses	5	C
TOPINT	Total operating interest	5	C
TOTA	Total acres initially owned and rented	1	C
TOTACRN	Total acres of corn	3	C
TOTASYB	Total acres of soybeans	3	C
TOTFMREV	Total farm revenue	5	C
TOTINCAP	Total interest on capital debt	5	C
TOTOPEXP	Total operating exp. (cash and non cash)	5	C
TOTTAX	Total tax (fed and fica)	4	C
TQC	Total quantity of corn produced this cycle	4	C
TQS	Total quantity of soy produced this cycle	4	C
TRENT	Total rental expenses this cycle	5	C
TREPAIRS	Total cash expenses for repairs	5	C
TROWCOST	Total cost of liquidating assets	5	C
TSUMCFE	Total fixed costs less interest after opt.	4	C
TTOTA	Total acres farmed during the current year	3	C
TTOTACRN	Total acres of corn during search routine	4	C
TTOTASYB	Total acres of soy during search routine	4	C
TXGAIN	Taxable gain realized on asset sale	5	C
USERNAM$	User's name for printing and ident.	1	I
VALPAO	Value per acre owned	2	C
VOLLCB.L	Percent of parcel required to be liq.	4	C
VOLLIQMIN.C	Liquid. cur. assets to bal. credit reserve	2	C
VOLLIQMIN.I	Liquid. intermed. asset to bal. cred. res.	2	C
VOLLIQMIN.IL	Liquid. land to bal. intermed. cred. res.	2	C

VOLLIQMIN.L	Liquid. real estate to bal. credit reserve	2	C
VOLLIQMIN.LI	Liquid. intermed. asset to bal. land cred.	2	C
VOLLIQU.C	Liquid. cur. assets during optimization	4	C
VOLLIQU.I	Liquid. intermed. asset during optimizat.	4	C
VOLLIQU.IT	Liquid. intermed. asset search variable	4	C
VOLLIQU.LI	Total real estate sold or released by firm	4	C
VOLLIQU.LO	Liquid. real estate during optimization	4	C
VOLLIQU.LR	Terminate the lease on $ of rental acreage	4	C
VOLLIQU.T	Total assets sold or terminate lease on	4	C
VOLLRES	Required liq. above current parcel value	2	C
VOLPCT	Volliqu unit of incrementation	1	I
WITHDRWLS	Family living and non-farm cashout	1	C&I
YLDC	Expected yield calculation: corn	2	C
YLDS	**Expected yield calculation: soybeans**	**2**	**C**

Note: ORIGIN consists of two components - the first is the module in which the variable is first used. For example (1) refers to module 1. The second component in the ORIGIN column identifies whether the variable is inputted by the user (I) or calculated (C) by the computer simulation model.

APPENDIX B

APPENDIX B

SIMULATION MODEL SOURCE CODE

MODULE: START.BAS

```
5 REM ***************          START.BAS              ***************
7 REM *************** DATE LAST UPDATED 11/14/88 ***************
8 REM *************** DATE LAST PRINTED 12/01/88 ***************
9 REM *************** TIME LAST PRINTED 10:10 AM ***************
10 DIM CCVE(3,12),SCVE(3,12),CVE$(12),INFLA(11),CUMINFLA(10),RI(100),EI(100),CBB
V(2,15),CBMV(2,15),OPT.WRKFLE(16,13),OPT.EU#(16),OPT.ACTEU#(16),DISFAC(10,6),ASS
ETP.L(10),CFE(5),CFE$(5),REIR(10),SYBPRYR$(10),CRNPRYR$(10),SYBPR(10),CRNPR(10),
YG(3),IPPC(3)
11 DIM TASSET.C(4),ASSET.I(4),ASSET.L(4),TASSETS.M(4),TDBT.C(4),TDBT.I(4),TDBT.L
(4),TDBT.CB(4),TDBT.M(4),TEQTPOS.M(4),CRDRESR.C(4),CRDRESR.I(4),CRDRESR.L(4),CRD
RESR.W(4),AO(4),AR(4),E0(4),E1(4),PRBBRY(4),MAXER.W(4),MAXEM.W(4),ACFXPC(4),ACFX
PS(4),IPPS(3)
12 DIM CRDRESM.C(4),CRDRESM.I(4),CRDRESM.L(4),CRDRESM.W(4),VOLLIQMIN.C(4),VOLLIQ
MIN.I(4),VOLLIQMIN.IL(4),VOLLIQMIN.L(4),VOLLIQMIN.LI(4),VOLLIQU.I(4),VOLLIQU.IT(
4),VOLLIQU.LO(4),VOLLIQU.LR(4),VOLLIQU.T(4),FORLIQ.I(4),FORLIQ.L(4),ROWCOST(4),C
FXEXP(4)
13 DIM AVAILASS.C(4),GAMMA1S(4),IN.C(4),IN.I(4),IN.L(4),ROW.C(4),ROW.I(4),ROW.L(
4),ROW.WE0(4),DEL.WE0(4),DEL.C(4),DEL.I(4),DEL.L(4),CASHDP.C(4),CASHDP.I(4),CASH
DP.L(4),TERM.C(4),TERM.I(4),TERM.L(4),MINCR.C(4),MINCR.I(4),MINCR.L(4),PIPMT(4),
CAPINV(4)
15 DIM PSY(5),PCY(5),TCFE(5),CBASE.L(10),EU#(16),SUMMINCR(4),RTROWCOST(4),IROWCO
ST(4)
25 CHAIN "MODTEST1",,ALL
```

```
10 REM ***************     MODULE: MODTEST1      ***************
20 REM *************** DATE LAST UPDATED 11/27/88 ***************
30 REM *************** DATE LAST PRINTED 11/26/88 ***************
40 REM *************** TIME LAST PRINTED 09:00 AM ***************
160 REM MODULE TEST#1  MEDIUM EQUITY FARM
170  GOSUB  280:REM      MODEL INITIALIZATION DATA STRIP
200  GOSUB 1690:REM      TITLE PAGE
210  GOSUB 1980:REM      INTRODUCTION SCREEN
220  GOSUB 2800:REM      OPERATOR INFORMATION AND FAMILY LIVING INITIALIZATION
230  GOSUB 3140:REM      CROP ACREAGE INPUT SUBROUTINE
240  GOSUB 3530:REM      MACHINERY ACCOUNTING INPUT INITIALIZATION
250 GOSUB 3780:REM      DETERMINISTIC INPUTS INITIALIZATION
260 GOSUB 4860:REM      INITIAL MACHINERY EQUATION CALCULATIONS
265 CLS:LOCATE 9,27:PRINT "Model Now Loading Module No.2"
270 LOCATE 11,30:PRINT "One Moment Please ...":BEEP:CHAIN "MOD2",,ALL
280 REM DATA REQUIRED FOR MODEL INITIALIZATION
290 CLS:KEY OFF:DEF SEG = 0:POKE 1047,64:DEF SEG:REM SET CAP LOCK & CSR CONTROL
300 REM INTRODUCTION SCREEN WHILE INITIALIZING
310 LOCATE 11,30:PRINT "One Moment Please ...":BEEP
320 REM INITIALIZE SIMULATION CYCLE VARIABLES
330 PYEAR=1982:YEAR=1988:BYEAR=1988:CYCLE=1:P=1:PAR=1:DEE$=" NnYy"
340 REM INITIALIZE STRING CLEARING CONSTANTS
350 S5$=STRING$(5,32):S7$=STRING$(7,32):S10$=STRING$(10,32):S20$=STRING$(20,32):
    S39$=STRING$(39,32):S79$=STRING$(79,32):DASH$=STRING$(5,45)
360 REM ESTABLISHING THE NUMBER OF RANDOM DRAWS AND GAMMA INC.
370 RI=30:GAMINC=.025
380 REM ESTABLISHING NATURAL LOG CONSTANT
390 LN=2.718281828#
400 REM INITIALIZING THE DIMENSIONS OF THE DATA ARRAYS IS INCLUDED IN START.BAS
420 REM SETTING PRICE ADJUSTMENT TOLERANCES
430 TOLC= .51:TOLS=1.01
440 REM SETTING ASSET LIQUIDATION PARAMETERS FOR THE VOLLIQU ROUTINE
450 PVOLLIQU.T=.2:PVOLLIQU.LO=.5:PVOLLIQU.LR=.5:VOLPCT=.04:
460 REM OPTIMIZATION SEARCH STOPPING CONDITIONS
470 REM PUR.STOP=(.5*PPPA):REN.STOP=(.5*RRPA) - SEE LINES 3120,220  MOD.1,MOD.1A
480 REM READ CBBVM AND CBBVG DATA ARRAYS
490 FOR I=1 TO 2:FOR J=1 TO 11:READ CBBV(I,J):NEXT J:NEXT I
500 REM CBBVM AND CBBVG MACHINERY DATA
510 DATA 1,1.165,1.327,1.483,1.633,1.775,1.91,2.047,2.167,2.28,2.386,1.0,1.089,1
.18,1.274,1.369,1.466,1.564,1.662,1.744,1.814,1.877
520 REM READ CBMVM AND CBMVG DATA ARRAYS
530 FOR I=1 TO 2:FOR J=1 TO 11:READ CBMV(I,J):NEXT J:NEXT I
540 REM CBMVM AND CBMVG MACHINERY DATA
550 DATA 1,1.119,1.232,1.34,1.443,1.54,1.635,1.732,1.816,1.896,1.972,1,1.065,1.1
31,1.199,1.267,1.335,1.405,1.474,1.543,1.612,1.68
560 REM READ CASH VARIABLE EXPENSE LABELS
570 FOR I=1 TO 12:READ CVE$(I):NEXT I
580 DATA "LABOR: HIRED/PAID FAMILY","MACHINERY REPAIRS","SEED","FERTILIZER","CHE
MICALS","OTHER CROP EXPENSE (MKTING)","UTILITIES","CUSTOM HIRE","FUEL & OIL","DR
YING FUEL","TRUCKING - FREIGHT","MISCELLANEOUS"
590 REM READ CASH VARIABLE EXPENSE BUDGETS FOR CORN:SOURCE 1988 MSU BUDGET BOOK
600 FOR I=1 TO 3:FOR J=1 TO 12:READ CCVE(I,J):NEXT J:NEXT I
610 REM CORN AT 80 BPA
620 DATA 36.30, 20.50, 18.20, 26.70, 15.20, 0.80, 2.00, 0, 9.80, 24.00, 16.00,
630 REM CORN AT 100 BPA
640 DATA 37.00, 20.50, 19.60, 31.50, 15.20, 1.00, 2.50, 0, 9.90, 30.00, 20.00, 0
650 REM CORN AT 120 BPA
```

```
660 DATA 37.60, 20.50, 21.00, 44.70, 15.20, 1.20, 3.00, 0, 10.00, 36.00, 24.00,
0
670 REM READ CASH VARIBLE EXPENSE BUDGETS FOR SOYBEANS:SOURCE 1988 MSU BUDGET BO
OK
680 FOR I=1 TO 3:FOR J=1 TO 12:READ SCVE(I,J):NEXT J:NEXT I
690 REM SOYBEAN AT 25 BPA
700 DATA 23.75, 17.50, 12.00, 11.50, 17.90, 0.25, 1.50, 0, 8.80, 0, 5.00, 0
710 REM SOYBEAN AT 30 BPA
720 DATA 24.40, 17.50, 12.00, 11.50, 17.90, 0.30, 1.50, 0, 8.90, 0, 6.00, 0
730 REM SOYBEAN AT 40 BPA
740 DATA 25.10, 17.50, 12.00, 15.50, 17.90, 0.40, 1.50, 0, 9.00, 0, 8.00, 0
750 REM TOTAL ACREAGE VOLUME DISCOUNT FACTORS FOR SEED, FERTILIZER AND CHEMICAL
760 FOR I=3 TO 5:FOR J=1 TO 6:READ DISFAC(I,J):NEXT J:NEXT I
770 DATA 0,.024,.036,.043,.065,.108,0,.022,.022,.028,.036,.066,0,.014,.023,.027,
.030,.078
780 REM READ INFLATION EXPECTATION ARRAY
790 FOR I=1 TO 11:READ INFLA(I):NEXT I
800 REM PROJECTED GNP PRICE DEFLATOR FOR 1988-1997: WEFG GROUP, 2nd Quarter 1988
810 DATA 1,1.042, 1.047, 1.044, 1.044, 1.045, 1.045, 1.046, 1.046, 1.046,1.046
811 REM READ AGGREGATED INFLATION EXPECTATION ARRAY
812 REM CUMULATIVE INFLATION FOR 1988-1997
814 FOR I=1 TO 10:READ CUMINFLA(I):NEXT I
816 DATA 1,1.031, 1.073, 1.120, 1.164, 1.208, 1.253, 1.298, 1.344, 1.390
820 REM READ REAL ESTATE PRICE ADJUSTMENT FACTORS
830 REM REIR(I)=INFLA(I) FOR ALL PERIODS
840 FOR I=1 TO 10:READ REIR(I):NEXT I
850 REM REAL INTEREST RATE CALCULATION FOR 1988-1997: SHORT TERM RATE-GNP DEFLAT
OR FROM WEFG GROUP, 2nd Quarter 1988
860 REM DATA 1.031, 1.0420, 1.0470, 1.0440, 1.0440, 1.0450, 1.045, 1.046, 1.046,
 1.46
861 DATA .0615, .0555, .0425, .0415, .0425, .0425, .0435, .0435, .0445, .0445
870 REM READ CASH FIXED EXPENSE LABELS
880 FOR I=1 TO 5:READ CFE$(I):NEXT I
890 REM DATA FOR CASH FIXED EXPENSES
900 DATA "LAND RENT","REAL ESTATE TAX","BUILDING REPAIRS","INSURANCE","OTHER"
910 REM READ CORN YEAR AND PRICE
920 FOR I=1 TO 10:READ CRNPRYR$(I),CRNPR(I):NEXT I
930 REM DATA FOR CORN PRICES: SOURCE MSU AGMOD, July 1988
940 DATA 1988, 2.93, 1989, 2.78, 1990, 2.91, 1991, 3.16, 1992, 3.06, 1993, 2.51,
 1994, 2.42, 1995, 2.63, 1996, 2.62, 1997, 2.68
950 REM READ SOY YEAR AND PRICE
960 FOR I=1 TO 10:READ SYBPRYR$(I),SYBPR(I):NEXT I
970 REM DATA FOR SOYBEAN PRICES: SOURCE MSU AGMOD July 1988
980 DATA 1988, 9.20, 1989, 9.32, 1990, 8.62, 1991, 8.73, 1992, 8.49, 1993, 7.77,
 1994, 7.97, 1995, 7.99, 1996, 8.17, 1997, 8.27
990 REM READ YIELD GUARENTEE LEVELS
1000 FOR I=1 TO 3:READ YG(I):NEXT I
1010 DATA .5, .65, .75
1020 REM READ INDEMNITY PRICE PERCENTAGES ( CORN )
1030 FOR I=1 TO 3:READ IPPC(I):NEXT I
1040 DATA .7, .85, 1.0
1050 REM READ INDEMNITY PRICE PERCENTAGES ( SOY )
1060 FOR I=1 TO 3:READ IPPS(I):NEXT I
1070 DATA .7, .85, 1.0
1080 REM TRANSACTION COST FACTORS FOR WHEN FARMER NEEDS TO PURCHASE GRAIN TO SAT
ISFY FORWARD CONTRACT COMMITMENT
1090 CTCF=.03:STCF=.03
1100 RETURN
1690 REM TITLE PAGE
1700 CLS:WIDTH 40:COLOR 15
```

```
1710 LOCATE 4,5:PRINT "INTEGRATED FINANCIAL SIMULATION"
1720 LOCATE 6,6:PRINT " MODEL FOR CORN/SOYBEAN FARMS"
1730 LOCATE 9,19:PRINT "by"
1740 LOCATE 11,12:PRINT"William Burghardt"
1750 LOCATE 14,8:PRINT "Michigan State University"
1760 LOCATE 15,10:PRINT"East Lansing, Michigan"
1770 LOCATE 16,7:PRINT"(c) Copyright December 1988"
1780 REM LOCATE 20,7:PRINT"Programmed by Mark Rosenberg"
1790 COLOR 23
1800 LOCATE 1,2,0:PRINT STRING$(37,15);
1810 FOR I= 2 TO 23:LOCATE I,2:PRINT CHR$(15);
1820 LOCATE I,38:PRINT CHR$(15);:NEXT I
1830 LOCATE 24,2:PRINT STRING$(37,15);
1840 MUS1$ = "MF T220 O3 L4 CC#DD-CC#D.P8 D16 P16 DE8FGA2.P4"
1850 PLAY "X" + VARPTR$(MUS1$)
1860 MUS2$ = "MF MS T220 O1 L4 F8P4.F8P4.F8P8F8P8F8P8. L8 O4 ML CC#DC#DD#E4C4F2
OO F8"
1870 PLAY "X" + VARPTR$(MUS2$)
1880 COLOR 7
1890 LOCATE 1,2,0:PRINT STRING$(37,15);
1900 FOR I= 2 TO 23:LOCATE I,2:PRINT CHR$(15);
1910 LOCATE I,38:PRINT CHR$(15);:NEXT I
1920 LOCATE 24,2:PRINT STRING$(37,15);
1930 COLOR 7
1940 LOCATE 24,8,0:PRINT" PRESS < C > TO CONTINUE ";
1950 IF INKEY$ <> "C" THEN 1950
1960 COLOR 7
1970 RETURN
1980 REM INTRO SCREEN
1990 CLS:WIDTH 80:COLOR 15
2000 PRINT TAB(30);"INTRODUCTION SCREEN":COLOR 7:PRINT:PRINT
2010 PRINT TAB(13);"Welcome to a truly user friendly micro computer program whic
h has"
2020 PRINT TAB(4);"been designed to fully integrate a farm firm's financial plan
ning activity"
2030 PRINT TAB(4);"with the more traditional management functions of production,
marketing and"
2040 PRINT TAB(4);"risk management.  For the benefit of the first time user, the
 program  can"
2050 PRINT TAB(4);"be thought of in terms of six major subsections:":PRINT
2060 LOCATE 10,10:PRINT;"1) Input background information about the farm family a
nd machinery"
2070 PRINT TAB(13);"management strategy"
2080 PRINT TAB(10);"2) Input firm specific and lender supplied financial data
2090 PRINT TAB(10);"3) Selection of the firm's production, marketing and insur-
2100 PRINT TAB(13);"ance strategies"
2110 PRINT TAB(10);"4) Analysis and selection of the firm's optimal asset and de
bt"
2120 PRINT TAB(13);"strategies to maximize the owner's after tax equity position
"
2130 PRINT TAB(10);"5) Simulation of the firm's cash flow and profitability base
d on"
2140 PRINT TAB(13);"the user's selected strategies with random prices and yields
2150 PRINT TAB(10);"6) Option to select from a wide range of summary tables for
review
2160 LOCATE 23,30,0:COLOR 15:PRINT "PRESS < C > TO CONTINUE":COLOR 7
2170 IF INKEY$ < > "C" THEN 2170
2180 CLS
2190 COLOR 15
2200 LOCATE 3,25:PRINT;"ENTERING DATA INTO THE PROGRAM":COLOR 7:PRINT:PRINT
```

```
2210 PRINT TAB(12);"The program will prompt you when to enter data along with gi
ving"
2220 PRINT TAB(4);"an indication as to the required input format. All data must
be entered "
2230 PRINT TAB(4);"without commas, for example 1000 instead of 1,000. Interest r
ates which are"
2240 PRINT TAB(4);"expressed as percentages should be entered as 10.0 and not as
 .10 throughout"
2250 PRINT TAB(4);"the entire program. When entering financial data it is recomm
ended that all"
2260 PRINT TAB(4);"asset and liability dollar amounts be rounded to the nearest
hundred dollars
2270 PRINT TAB(4);"to speed up data entry along with making the financial statem
ents easier to
2280 PRINT TAB(4);"read.
2290 PRINT:PRINT TAB(12);"Keep in mind that this program is a financial model, a
nd as such"
2300 PRINT TAB(4);"must be both abstract and by necessity a simplification of re
ality. The"
2310 PRINT TAB(4);"results obtained are based on the strategies you select along
 with the econ
2320 PRINT TAB(4);"-omic assumptions the author built into the program.
2330 LOCATE 23,30,0:COLOR 15:PRINT "PRESS < C > TO CONTINUE":COLOR 7
2340 IF INKEY$ <> "C" THEN 2340
2350 CLS
2360 LOCATE 1,9:COLOR 15:PRINT;"A FEW WORDS ABOUT THE TIMING OF KEY DECISIONS AN
D CREDIT RESERVES":COLOR 7:PRINT
2370 PRINT TAB(10);"Management decisions both tactical (day to day) and strategi
c (longer"
2380 PRINT TAB(4);"term) are assumed to take place on only two days of the year.
 Those two days"
2390 PRINT TAB(4);"include December 31st when the firm closes out it's operating
 year and pre-"
2400 PRINT TAB(4);"pares it's finacial and income statements and January 1st whe
n it is assumed"
2410 PRINT TAB(4);"the firm's management has an appointment to visit their prima
ry lender(s).
2420 PRINT TAB(4);"The focus of their meeting with their major creditors is two
fold:":PRINT
2430 PRINT TAB(10);"1) To permit the lenders to review their firm's financial pe
rform-
2440 PRINT TAB(13);"ance during the past year and make any necessary changes to
the
2450 PRINT TAB(13);"lender controlled variables eg. the interest rate on the loa
n.
2460 PRINT TAB(10);"2) To outline their firm's proposed operating and capital in
vest-
2470 PRINT TAB(13);"ment budgets for the coming year.
2480 PRINT
2490 PRINT TAB(10);"Once the lender(s) have established the firm's credit reserv
es for the
2500 PRINT TAB(4);"coming year management can utilize credit reserves for invest
ment purposes.
2510 PRINT TAB(4);"It is assumed that 100% of the production input loan request
is approved
2520 PRINT TAB(4);"independent of the operating credit reserve established by th
e lender.
2530 PRINT TAB(4);"However, the firm's total available credit will be influenced
 by how the
2540 PRINT TAB(4);"firm decides to invest in machinery and land.
```

```
2550 LOCATE 23,30,0:COLOR 15:PRINT "PRESS < C > TO CONTINUE":COLOR 7
2560 IF INKEY$ <> "C" THEN 2560
2570 CLS:COLOR 15
2580 LOCATE 1,18:PRINT;"WHAT WILL YOU GAIN FROM RUNNING THIS PROGRAM?":PRINT
2590 COLOR 7
2600 PRINT TAB(9);"The major benefits to be derived from taking the time to work
 with
2610 PRINT TAB(9);"this computer program include:":PRINT
2620 PRINT TAB(6);"1) Increased understanding of the interaction between key mac
ro"
2630 PRINT TAB(9);"economic and financial variables on the firm's optimal strate
gy"
2640 PRINT TAB(9);"for financial growth over a planning horizon of up to ten yea
rs."
2650 PRINT
2660 PRINT TAB(6);"2) Capability to simulate alternative production, marketing a
nd"
2670 PRINT TAB(9);"all risk insurance strategies and evaluate their combined imp
act"
2680 PRINT TAB(9);"on the financial performance of the farm firm.":PRINT
2690 PRINT TAB(6);"3) Opportunity to examine a wide range of asset acquisition p
ro-"
2700 PRINT TAB(9);"posals along with assessing the financial impact of alternati
ve"
2710 PRINT TAB(9);"financing arrangements on the firm's available credit reserve
s"
2720 PRINT TAB(9);"and probability of bankruptcy.":PRINT
2730 PRINT TAB(6);"4) Introduction to the capability of micro computers as a man
age-"
2740 PRINT TAB(9);"ment tool to aid agricultural decision makers in their analys
is"
2750 PRINT TAB(9);"of increasingly complex economic issues under uncertainty.
2760 COLOR 15:LOCATE 23,13,0:PRINT;"With This As An Introduction":LOCATE 23,44,0
:PRINT"PRESS < B > TO BEGIN"
2770 IF INKEY$ <> "B" THEN 2770
2780 COLOR 7
2790 RETURN
2800 REM OPERATOR & INTRODUCTORY INFORMATION SUBROUTINE
2810 CLS:COLOR 15:PRINT TAB(20);"OPERATOR BACKGROUND INFORMATION":COLOR 7:PRINT:
PRINT
2820 PRINT:PRINT TAB(15);"OPERATOR NAME       :  ";USERNAM$
2830 PRINT:PRINT TAB(15);"NO. OF DEPENDENTS   :  ";:PRINT USING "       ##";NUMDE
P
2840 PRINT:PRINT TAB(15);"1986 FAMILY LIVING :  ";:PRINT USING "$$###,###";FAMLI
V82
2850 PRINT:PRINT TAB(15);"1987 FAMILY LIVING :  ";:PRINT USING "$$###,###";FAMLI
V83
2860 PRINT:PRINT TAB(15);"FAMILY MINIMUM EXP.:  ";:PRINT USING "$$###,###";MININ
C
2870 PRINT:PRINT TAB(15);"FAMILY MAXIMUM EXP.:  ";:PRINT USING "$$###,###";MAXIN
C
2880 PRINT:PRINT TAB(15);"1987 TAX RATE       :  ";:PRINT USING "    ##.## %";100
*TAX83
2890 PRINT:PRINT:PRINT TAB(15);"NUMBER OF CYCLES (1 - 10)    ";CYCLES
2900 LOCATE 23,20:COLOR 15:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?":COLOR 7
2910 D$=INKEY$:IF INSTR(DEE$,D$) < 2  THEN 2910
2920 D=INSTR(DEE$,D$):IF D < 4 THEN GOTO 3090:ELSE X=CSRLIN-19:LOCATE 23,1:PRINT
 S79$;
2930 LOCATE X,55:INPUT"=> ",A$:IF A$ < > "" THEN USERNAM$=A$:LOCATE X,38:PRINT A
$;S20$:ELSE LOCATE X,55:PRINT S20$
```

```
2940 X=X+2
2950 LOCATE X,48:INPUT"=> ",A$:IF A$ < > "" THEN NUMDEP=VAL(A$):LOCATE X,44:PRIN
T USING "##";VAL(A$);:PRINT S20$:ELSE LOCATE X,48:PRINT S20$
2960 X=X+2
2970 LOCATE X,48:INPUT"=> ",A$:IF A$ < > "" THEN FAMLIVING82=VAL(A$):LOCATE X,37
:PRINT USING "$$###,###";FAMLIVING82;:PRINT S20$:ELSE LOCATE X,48:PRINT S10$
2980 X=X+2
2990 LOCATE X,48:INPUT"=> ",A$:IF A$ < > "" THEN FAMLIVING83=VAL(A$):LOCATE X,37
:PRINT USING "$$###,###";FAMLIVING83;:PRINT S20$:ELSE LOCATE X,48:PRINT S20$
3000 X=X+2
3010 LOCATE X,48:INPUT"=> ",A$:IF A$ < > "" THEN MININC=VAL(A$):LOCATE X,37:PRIN
T USING "$$###,###";MININC;:PRINT S20$:ELSE LOCATE X,48:PRINT S20$
3020 X=X+2
3030 LOCATE X,48:INPUT"=> ",A$:IF A$ < > "" THEN MAXINC=VAL(A$):LOCATE X,37:PRIN
T USING "$$###,###";MAXINC;:PRINT S20$:ELSE LOCATE X,48:PRINT S20$
3040 X=X+2
3050 LOCATE X,50:INPUT"=> ",A$:IF A$ < > "" THEN TAX83=VAL(A$)/100:LOCATE X,37:P
RINT USING "    ##.## %";TAX83*100;:PRINT S20$:ELSE LOCATE X,50:PRINT S20$
3060 X=X+3
3070 LOCATE X,50:INPUT"=> ",A$:IF A$ < > "" THEN CYCLES=VAL(A$):LOCATE X,44:PRIN
T USING "##";CYCLES;:PRINT S20$:ELSE LOCATE X,50:PRINT S20$
3080 GOTO 2900
3090 FLAVE=(FAMLIV82+FAMLIV82)/2
3100 WGTAVFAML=FLAVE
3110 EFAMLIVING=ALPHA*FAMLIV83+(1-ALPHA)*WGTAVFAML
3120 TAXRATE=TAX83
3130 RETURN
3140 REM CROP ACREAGE INPUT SUBROUTINE
3150 CLS
3160 COLOR 15:PRINT TAB(21);"* * PRODUCTION AND MARKETING DATA * *"
3170 PRINT:PRINT TAB(31);"CROPLAND ACREAGE":COLOR 7
3180 PRINT:COLOR 15:PRINT"CURRENT TILLABLE ACREAGE :  ";:COLOR 7:PRINT"OWNED   "
;:PRINT USING"###,###";AO
3190 PRINT TAB(29);"RENTED  ";:PRINT USING"###,###";AR
3200 PRINT TAB(36);DASH$;DASH$
3210 TOTA=AO+AR:PRINT TAB(29);"TOTAL  ";:PRINT USING"###,####";TOTA;:PRINT S10$
3220 PRINT:COLOR 15:PRINT"DOES THE OPPORTUNITY EXIST FOR :":COLOR 7:PRINT
3230 PRINT TAB(10);"PURCHASING ADDITIONAL TILLABLE LAND          "
3240 PRINT:PRINT TAB(10);"PURCHASE PRICE PER ACRE             ";USING "$$#,###";
PPPA
3250 PRINT TAB(10);"AVAILABLE ACREAGE AT ";:PRINT USING "$$#,###        ###,###"
;PPPA;PAL
3260 PRINT:PRINT
3270 PRINT TAB(10);"RENTING/LEASING ADDITIONAL TILLABLE LAND      "
3280 PRINT:PRINT TAB(10);"RENTAL RATE PER ACRE                ";USING "$$#,###";
RRPA
3290 PRINT TAB(10);"AVAILABLE ACREAGE AT ";:PRINT USING "$$#,###        ###,###"
;RRPA;RAL
3300 LOCATE 24,1:PRINT S79$;:COLOR 15:LOCATE 24,10:PRINT "DO YOU WANT TO MAKE AN
Y CHANGES ?";:COLOR 7
3310 D$=INKEY$ : IF INSTR(DEE$,D$) < 2 THEN 3310
3320 D=INSTR(DEE$,D$):IF D < 4 THEN PUR.STOP=.5*PPPA:REN.STOP=.5*RRPA:RETURN:ELS
E LOCATE 24,1:PRINT S79$;
3330 X=CSRLIN-19
3340 LOCATE X,46:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,37:PRINT USING"###,###";
VAL(A$);:PRINT S20$:AO=VAL(A$):ELSE LOCATE X,46:PRINT;S20$
3350 X=X+1
3360 LOCATE X,46:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,37:PRINT USING"###,###";
VAL(A$);:PRINT S20$:AR=VAL(A$):ELSE LOCATE X,46:PRINT;S20$
3370 TOTA=AO+AR:LOCATE X+2,36:PRINT USING"####,###";TOTA
```

```
3380 X=X+6
3390 LOCATE X,46:INPUT "(Y/N) ?",A$
3400 IF A$="N" OR A$="n" THEN PATL$="N":PPPA=0:PAL=0:LOCATE X,46:COLOR 15:PRINT"
 NO";:COLOR 7:PRINT S20$:ELSE GOTO 3420
3410 X=X+2:LOCATE X,46:PRINT USING"$$#,###";PPPA:X=X+1:LOCATE X,31:PRINT USING"$
$#,###        ###,###";PPPA;PAL:GOTO 3450
3420 IF A$="Y" OR A$="y" THEN PATL$="Y":LOCATE X,46:COLOR 15:PRINT" YES";:COLOR
7:PRINT S20$:ELSE LOCATE X,46:PRINT S20$:GOTO 3390
3430 X=X+2:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "$$
#,###";VAL(A$);:PRINT S20$:PPPA=VAL(A$):LOCATE X+1,31:PRINT USING"$$#,###";PPPA:
ELSE LOCATE X,55:PRINT;S20$
3440 X=X+1:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "##
#,###";VAL(A$);:PRINT S20$:PAL=VAL(A$):ELSE LOCATE X,55:PRINT;S20$
3450 X=X+3
3460 LOCATE X,51:INPUT "(Y/N) ?",A$
3470 IF A$="N" OR A$="n" THEN RLTL$="N":RRPA=0:RAL=0:LOCATE X,51:COLOR 15:PRINT"
 NO";:COLOR 7:PRINT S20$:ELSE GOTO 3490
3480 X=X+2:LOCATE X,46:PRINT USING"$$#,###";RRPA:X=X+1:LOCATE X,31:PRINT USING"$
$#,###        ###,###";RRPA;RAL:GOTO 3520
3490 IF A$="Y" OR A$="y" THEN RLTL$="Y":LOCATE X,51:COLOR 15:PRINT" YES";:COLOR
7:PRINT S20$:ELSE LOCATE X,51:PRINT S20$:GOTO 3460
3500 X=X+2:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "$$
#,###";VAL(A$);:PRINT S20$:RRPA=VAL(A$):LOCATE X+1,31:PRINT USING"$$#,###";RRPA:
ELSE LOCATE X,55:PRINT;S20$
3510 X=X+1:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "##
#,###";VAL(A$);:PRINT S20$:RAL=VAL(A$):ELSE LOCATE X,55:PRINT;S20$
3520 GOTO 3300
3530 REM MACHINERY ACCOUNTING INPUT SUBROUTINE
3540 CLS:PRINT TAB(23);:COLOR 15:PRINT"MACHINERY ACCOUNTING INFORMATION":COLOR 7
:PRINT
3550 X=3:LOCATE X,1
3560 PRINT:PRINT TAB(10);"BOOK VALUE OF MACHINERY :  ";USING "$$######,###";MEBV
:PRINT:PRINT TAB(20);"( If unknown please enter < ? > )"
3570 X=X+1
3580 LOCATE X,50:INPUT"=> ",A$:IF A$ < > "" THEN MEBV=VAL(A$):LOCATE X,37:PRINT
USING "$$######,###";VAL(A$);:PRINT S20$:ELSE LOCATE X,50:PRINT S20$
3590 X=X+4
3600 LOCATE X,1:PRINT "       - Is your firm currently pursuing a Growth or Main
tenance                        phase of machinery managment";S5$:PRINT:PRINT TA
B(20);"( Please enter < G > or < M >  )"
3610 X=X+1
3620 LOCATE X,40:INPUT" ",PHASE$
3630 IF PHASE$="M" THEN A$="MAINTAINING":ELSE IF PHASE$="G" THEN A$="EXPANDING":
ELSE X=X-1:GOTO 3600
3640 X=X+4
3650 LOCATE X,1:PRINT "       - For how many years has your firm been ";A$;" it'
s inventory";S5$:PRINT:PRINT TAB(20);"( If unknown please enter < ? > )"
3660 LOCATE X,75:INPUT"",T$:IF T$="?" THEN T=2
3670 IF PHASE$="G" THEN TT=T
3680 X=X+4
3690 LOCATE X,1:PRINT "       - Has your firm refinanced with long term debt wit
hin                            the last year";S5$:PRINT:PRINT TAB(20);"( Please
 enter < Y > or < N > )"
3695 X=X+1
3700 LOCATE X,24:INPUT;REFINANCE$
3705 IF REFINANCE$="N" THEN  REFINYRS=0 ELSE REFINYRS=1:GOTO 3750
3710 REM IF REFINANCE$="N" THEN LOCATE X+4,1:PRINT S79$:PRINT S79$:GOTO 3750
3720 REM X=X+4
3730 REM LOCATE X,1:PRINT "       - How many years ago did your firm refinance w
ith long term debt":PRINT:PRINT TAB(19);"( Please enter < 1 > , < 2 > or < 3 > )
```

```
3740 REM LOCATE X,73:INPUT;REFINYRS
3750 LOCATE 23,1:PRINT S79$;:LOCATE 23,23:COLOR 15:PRINT"DO YOU WANT TO MAKE ANY
 CHANGES ?":COLOR 7
3760 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 3760:ELSE D=INSTR(DEE$,D$)
3770 IF D < 4 THEN RETURN :ELSE LOCATE 23,1:PRINT S79$;:GOTO 3550
3780 REM DETERMINISTIC INPUT SUBROUTINE
3790 CLS:WIDTH 80:PRINT TAB(20);:COLOR 15:PRINT"DETERMINISTIC INPUTS : MARKET BA
SIS VALUE":COLOR 7:PRINT
3800 REM SET CURSOR CONTROLS
3810 INI.X=CSRLIN:INI.Y=POS(0):GOTO 4430
3820 IF FLAG0=1 THEN ASSET.C=VAL(I$)
3830 PRINT" ASSET.C  = ";USING "$$####,### ";ASSET.C;:PRINT S5$;:RETURN
3840 IF FLAG0=1 THEN ASSET.I=VAL(I$)
3850 PRINT" ASSET.I  = ";USING "$$####,### ";ASSET.I;:PRINT S5$;:RETURN
3860 IF FLAG0=1 THEN ASSET.L=VAL(I$)
3870 PRINT" ASSET.L  = ";USING "$$####,### ";ASSET.L:RETURN
3880 IF FLAG0=1 THEN CASHOUT=VAL(I$)
3890 PRINT" CASHOUT  = ";USING "$$####,### ";CASHOUT;:PRINT S5$;:RETURN
3900 IF FLAG0=1 THEN MEBV#=VAL(I$)
3910 PRINT" MACH.BV  = ";USING "$$####,### ";MEBV;:PRINT S5$;:RETURN
3920 IF FLAG0=1 THEN CBASET.L=VAL(I$)
3930 PRINT" CBASET.L = ";USING "$$####,### ";CBASET.L:RETURN
3940 IF FLAG0=1 THEN DBT.C=VAL(I$)
3950 PRINT" DEBT.C   = ";USING "$$####,### ";DBT.C;:PRINT S5$;:RETURN
3960 IF FLAG0=1 THEN DBT.I=VAL(I$)
3970 PRINT" DEBT.I   = ";USING "$$####,### ";DBT.I;:PRINT S5$;:RETURN
3980 IF FLAG0=1 THEN DBT.L=VAL(I$)
3990 PRINT" DEBT.L   = ";USING "$$####,### ";DBT.L:RETURN
4000 IF FLAG0=1 THEN ROW.C=VAL(I$)/100
4010 PRINT" ROW.C    = ";USING "   ##.## % ";ROW.C*100;:PRINT S5$;:RETURN
4020 IF FLAG0=1 THEN ROW.I=VAL(I$)/100
4030 PRINT" ROW.I    = ";USING "   ##.## % ";ROW.I*100;:PRINT S5$;:RETURN
4040 IF FLAG0=1 THEN ROW.L=VAL(I$)/100
4050 PRINT" ROW.L    = ";USING "   ##.## % ";ROW.L*100:RETURN
4060 IF FLAG0=1 THEN DEL.C=VAL(I$)/100
4070 PRINT" DEL.C    = ";USING "   ##.## % ";DEL.C*100;:PRINT S5$;:RETURN
4080 IF FLAG0=1 THEN DEL.I=VAL(I$)/100
4090 PRINT" DEL.I    = ";USING "   ##.## % ";DEL.I*100;:PRINT S5$;:RETURN
4100 IF FLAG0=1 THEN DEL.L=VAL(I$)/100
4110 PRINT" DEL.L    = ";USING "   ##.## % ";DEL.L*100:RETURN
4120 IF FLAG0=1 THEN IN.C=VAL(I$)/100
4130 PRINT" IN.C     = ";USING "   ##.## % ";IN.C*100;:PRINT S5$;:RETURN
4140 IF FLAG0=1 THEN IN.I=VAL(I$)/100
4150 PRINT" IN.I     = ";USING "   ##.## % ";IN.I*100;:PRINT S5$;:RETURN
4160 IF FLAG0=1 THEN IN.L=VAL(I$)/100
4170 PRINT" IN.L     = ";USING "   ##.## % ";IN.L*100:RETURN
4180 IF FLAG0=1 THEN MINCR.C=VAL(I$)
4190 PRINT" MINCR.C  = ";USING "$$####,### ";MINCR.C;:PRINT S5$;:RETURN
4200 IF FLAG0=1 THEN MINCR.I=VAL(I$)
4210 PRINT" MINCR.I  = ";USING "$$####,### ";MINCR.I;:PRINT S5$;:RETURN
4220 IF FLAG0=1 THEN MINCR.L=VAL(I$)
4230 PRINT" MINCR.L  = ";USING "$$####,### ";MINCR.L:RETURN
4240 IF FLAG0=1 THEN CASHDP.C=VAL(I$)/100
4250 PRINT" CASHDP.C = ";USING "   ##.## % ";CASHDP.C*100;:PRINT S5$;:RETURN
4260 IF FLAG0=1 THEN CASHDP.I=VAL(I$)/100
4270 PRINT" CASHDP.I = ";USING "   ##.## % ";CASHDP.I*100;:PRINT S5$;:RETURN
4280 IF FLAG0=1 THEN CASHDP.L=VAL(I$)/100
4290 PRINT" CASHDP.L = ";USING "   ##.## % ";CASHDP.L*100;:PRINT:RETURN
4300 IF FLAG0=1 THEN TERM.C=VAL(I$)
4310 PRINT" TERM.C   = ";USING "      ##.# ";TERM.C;:PRINT S5$;:RETURN
```

```
4320 IF FLAG0=1 THEN TERM.I=VAL(I$)
4330 PRINT" TERM.I    = ";USING "      ##.# ";TERM.I;:PRINT S5$;:RETURN
4340 IF FLAG0=1 THEN TERM.L=VAL(I$)
4350 PRINT" TERM.L    = ";USING "      ##.# ";TERM.L;:PRINT:RETURN
4360 IF FLAG0=1 THEN RFRR=VAL(I$)/100
4370 PRINT" RFRR      = ";USING "   ##.## % ";RFRR*100;:PRINT S5$;:RETURN
4380 IF FLAG0=1 THEN NONFINC=VAL(I$)
4390 PRINT" NONFINC   = ";USING "$$####,### ";NONFINC;:PRINT S5$;:RETURN
4400 IF FLAG0=1 THEN BAITC=VAL(I$)
4410 PRINT" BAITC     = ";USING "$$####,### ";BAITC;:PRINT:RETURN
4420 Y=0
4430 FOR I=1 TO 3:Y=Y+1
4440 ON Y GOSUB 3830, 3850, 3870, 3890, 3910, 3930, 3950, 3970, 3990, 4010, 4030
, 4050, 4070, 4090, 4110, 4130, 4150, 4170, 4190, 4210, 4230,4250,4270,4290,4310
,4330,4350,4370,4390,4410
4450 NEXT I
4460 PRINT
4470 IF Y<> 30 THEN 4430
4480 IF CYCLE =1 THEN 4520
4490 LOCATE 23,1:PRINT S79$;:LOCATE 23,24:COLOR 15:PRINT"DO YOU WANT TO MAKE ANY
 CHANGES ?":COLOR 7
4500 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 4500: ELSE D=INSTR(DEE$,D$)
4510 IF D < 4 THEN ASSETP.L(P)=ASSET.L:CBASE.L(P)=CBASET.L:RETURN:ELSE LOCATE 23
,1:PRINT S79$;
4520 JLOOP=1:NEW.X=INI.X:NEW.Y=INI.Y:L=0
4530 IF JLOOP>10 THEN 4490
4540 IF JLOOP>1 THEN L=L+3
4550 LOCATE NEW.X,NEW.Y:COLOR 0,7
4560 FOR K=1 TO 3
4570 ON K+L GOSUB 3830, 3850, 3870, 3890, 3910, 3930, 3950, 3970, 3990, 4010, 40
30, 4050, 4070, 4090, 4110, 4130, 4150, 4170, 4190, 4210, 4230,4250,4270,4290,43
10,4330,4350,4370,4390,4410
4580 NEXT K
4590 COLOR 15,0
4600 LOCATE 23,18:PRINT"DO YOU WANT TO MAKE ANY CHANGES ON THIS LINE ?":COLOR 7
4610 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 4610:ELSE D=INSTR(DEE$,D$)
4620 LOCATE NEW.X,NEW.Y
4630 FOR K=1 TO 3
4640 ON K+L GOSUB 3830, 3850, 3870, 3890, 3910, 3930, 3950, 3970, 3990, 4010, 40
30, 4050, 4070, 4090, 4110, 4130, 4150, 4170, 4190, 4210, 4230,4250,4270,4290,43
10,4330,4350,4370,4390,4410
4650 NEXT K
4660 IF D < 4 THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):JLOOP=JLOOP+1:GOTO 4530
4670 FOR I=L+1 TO L+3
4680 COLOR 0,7
4690 LOCATE NEW.X,NEW.Y
4700 OLD.X=NEW.X:OLD.Y=NEW.Y
4710 ON I GOSUB 3830, 3850, 3870, 3890, 3910, 3930, 3950, 3970, 3990, 4010, 4030
, 4050, 4070, 4090, 4110, 4130, 4150, 4170, 4190, 4210, 4230,4250,4270,4290,4310
,4330,4350,4370,4390,4410
4720 IF I=L+3 THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):ELSE NEW.X=CSRLIN:NEW.Y=POS(0)
4730 LOCATE 23,1
4740 COLOR 7,0:PRINT S79$:COLOR 0,7
4750 LOCATE 23,23:PRINT S39$;:LOCATE 23,24
4760 FLAG0=1
4770 ON I GOSUB 3830, 3850, 3870, 3890, 3910, 3930, 3950, 3970, 3990, 4010, 4030
, 4050, 4070, 4090, 4110, 4130, 4150, 4170, 4190, 4210, 4230,4250,4270,4290,4310
,4330,4350,4370,4390,4410
4780 LOCATE 23,47:INPUT" => ",I$
4790 IF LEN(I$)=0 THEN FLAG0=0:ELSE FLAG0=1
```

```
4800 COLOR 7,0:LOCATE 22,1:PRINT S79$
4810 LOCATE OLD.X,OLD.Y
4820 ON I GOSUB 3820, 3840, 3860, 3880, 3900, 3920, 3940, 3960, 3980, 4000, 4020
, 4040, 4060, 4080, 4100, 4120, 4140, 4160, 4180, 4200, 4220,4240,4260,4280,4300
,4320,4340,4360,4380,4400
4830 FLAG0=0
4840 NEXT I
4850 JLOOP=JLOOP+1:GOTO 4530
4860 REM INITIAL MACHINERY BALANCE SHEET UPDATE
4870 IF PHASE$="M" THEN M=1:GOTO 4880:ELSE G=2:GOTO 4930 : REM
4880 CBMV=CBMV(M,T):CBBV=CBBV(M,T)
4890 MEMV=ASSET.I
4900 MECB=MEMV*CBMV(M,T)
4910 IF MEBV=0 THEN MEBV=MECB*(1/CBBV(M,T))
4920 RETURN
4930 CBMV=CBMV(G,TT):CBBV=CBBV(G,TT)
4940 MEMV=ASSET.I
4950 MECB=MEMV*CBMV(G,TT)
4960 IF MEBV$="?" THEN MEBV=MECB*(1/CBBV(G,TT))
4970 RETURN
```

```
1 REM $INCLUDE: 'MODCOM'
10 REM ************              MODULE No.2          **************
20 REM ************** DATE LAST UPDATED 11/24/88  **************
30 REM ************** DATE LAST PRINTED 12/02/88  **************
40 REM ************** TIME LAST PRINTED 04:45 PM  **************
50 REM $INCLUDE: 'MODCOM'
170 IF FLAG.6A=1 THEN FLAG.6A=0:GOTO 220
180 GOSUB  330:REM       BALANCE SHEET UPDATE EQUATION SUBROUTINE
190 GOSUB 1360:REM       BANKRUPTCY SUBROUTINE
200 FLAG.6A=1
210 IF FLAG.LENDER=0 THEN STORE=1:CHAIN "MOD6A",,ALL
220 GOSUB 1390:REM       CALCULATE REQUIRED MACHINERY PURCHASE ( TASSETP.IR )
230 GOSUB 1450:REM       INITIAL CREDIT RESERVE (CASH,MACH,LAND) SUBROUTINE
240 GOSUB 1130 :REM       UPDATE TOTALS ON BALANCE SHEET EQUATIONS
250 GOSUB 6110:REM       INITIAL BALANCE SHEET FORMAT SUBROUTINE
270 IF FLAG.LENDER=1 THEN FLAG.LENDER=0:FLAG.6A=0:GOTO 300
280 GOSUB 6640:REM       LENDER DECISION SUBROUTINE
290 IF FLAG.LENDER=1 THEN GOTO 180
295 CLS:BEEP:LOCATE 11,30:PRINT "One Moment Please ..."
300 GOSUB 7980:REM       LAMDA INITIALIZATION
320 STORE=2:CHAIN "MOD6A",,ALL
330 DBT.C=DBT.C+.5*PPDLEASE : REM TO PREVENT DOUBLE ACCOUNTING OF PPDLEASE
340 REM BALANCE SHEET UPDATE EQUATIONS (CURRENT, INTERMEDIATE, REAL ESTATE)
350 REM REAL ESTATE ACCOUNTS UPDATE
360 VALPAO=ASSET.L/(AO):REM VALUE PER ACRE OWNED
370 TEMP.ASSET.L=ASSET.L
380 REM UPDATE THE CBASET.L ACCOUNT
390 VOLLCB.L=(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.L+LIQSHT+VOLLRES)/ASSETP.L(PAR)
400 IF VOLLCB.L=0 THEN GOTO 440
410 IF VOLLCB.L>1 THEN 610
420 SUMRED=SUMRED+VOLLCB.L
430 IF SUMRED>=1 THEN GOTO 500:REM CALCULATE LIQSHT
440 REM UPDATE THE CBASET.L ACCOUNT
450 CBASE.L(PAR)=CBASE.L(PAR)*(1-SUMRED)
460 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
470 ASSETP.L(PAR)=ASSETP.L(PAR)*(1-SUMRED)
480 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
490 GOTO 700:REM CONTINUE REAL ESTATE UPDATE CALCULATIONS
500 REM CALCULATE LIQSHT
510 LIQSHT=(SUMRED-1)*ASSETP.L(PAR)
520 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
530 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
540 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
550 REM BANKRUPTCY TEST
560 PAR=PAR+1
570 IF PAR>P THEN GOSUB 1360 : REM BANKRUPTCY SUBROUTINE
580 REM GO BACK TO CALC NEW VOLLCB.L
590 GOTO 390
600 REM ROUTINE FOR VOLLCB.L>1
610 REM CALCULATE VOLLRES
620 VOLLRES=(VOLLIQMIN.L+VOLLIQMIN.IL)-ASSETP.L(PAR)
630 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
640 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
650 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
660 PAR=PAR+1
670 IF PAR>P THEN GOSUB 1360
680 REM CALCULATE NEW VOLLCB.L
```

```
690 GOTO 390 : REM RECALC VOLLCB.L
700 AO=AO-(TEMP.ASSET.L-ASSET.L)/VALPAO
710 CCGT.L=(ASSET.L-CBASET.L)*TAXRATE
715 IF CCGT.L<0 THEN CCGT.L=0 ELSE CCGT.L=CCGT.L
720 DBT.L=DBT.L-(1-ROW.L)*VOLLIQMIN.L-(1-ROW.L)*VOLLIQU.L-(VOLLIQMIN.IL-(ROW.L*V
OLLIQMIN.IL)-VOLLIQI.L)
730 CP.L=(1/TERM.L)*DBT.L
740 LPDBT.L=DBT.L-CP.L
750 TDBT.L=LPDBT.L+CCGT.L
760 EQTPOS.L=ASSET.L-DBT.L
770 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
780 DE.L=DBT.L/EQTPOS.L
790 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
800 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
805 IF AR=0 AND RAL=0 THEN ASSET.PLR=0:PPRA=(ASSET.L/AO):GOTO 830
806 IF AR=0 AND RAL>0 THEN ASSET.PLR=0:PPRA=20*RRPA:THEN GOTO 830
810 IF AO=0 AND AR>0 THEN ASSET.PLR=AR*20*RRPA:ELSE ASSET.PLR=AR*(ASSET.L/AO)
820 IF AO>0 THEN PPRA=ASSET.PLR/AR: ELSE PPRA=20*RRPA
830 REM MACHINERY ACCOUNTS UPDATE
840 ASSET.I=ASSET.I-VOLLIQMIN.I-VOLLIQU.I-VOLLIQMIN.LI
850 MEMV=ASSET.I
860 MECB=MECB-(1/CBMV)*(VOLLIQMIN.I+VOLLIQU.I+VOLLIQMIN.LI)
870 MEBV=MEBV-(1/CBBV)*(CBMV+(VOLLIQMIN.I+VOLLIQU.I+VOLLIQMIN.LI))
880 ACCDEP=MECB-MEBV
890 CCGT.I=(ASSET.I-MEBV)*TAXRATE
895 IF CCGT.I<0 THEN CCGT.I=0 ELSE CCGT.I=CCGT.I
900 DBT.I=DBT.I-(1-ROW.I)*VOLLIQMIN.I-(1-ROW.I)*VOLLIQ.I-(VOLLIQMIN.LI-(ROW.I)*V
OLLIQMIN.LI-VOLLIQI.I)
910 CP.I=(1/TERM.I)*DBT.I
920 LPDBT.I=DBT.I-CP.I
930 TDBT.I=LPDBT.I+CCGT.I
940 EQTPOS.I=ASSET.I-DBT.I
950 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
960 CRDRESR.I=((1-ROW.I)*(1-DEL.I)/ROW.I)*EQTPOS.I-DBT.I
970 CRDRESM.I=((1-ROW.I)/ROW.I)*EQTPOSM.I-(DBT.I+CCGT.I)
975 DE.I=DBT.I/EQTPOS.I
980 REM CURRENT ASSET ACCOUNTS
990 IF AR = 0 THEN PPDLEASE=0:ELSE PPDLEASE=((ASSET.PLR+ASSET.LR)/(PPRA))*RRPA
1000 IF AR= 0 THEN LEAPAY.C=0:ELSE LEAPAY.C=((ASSET.PLR+ASSET.LR)/(PPRA))*RRPA*.
5
1010 TASSET.C=ASSET.C+PPDLEASE
1020 DBT.C=DBT.C+(PPDLEASE*.5)
1030 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
1040 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
1050 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
1060 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
1070 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
1080 TCRDRESR.C=CRDRESR.C
1090 CRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
1100 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
1110 AVAILASS.CI=AEQTPOS.C-MINEQTPOS.C
1120 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
1130 REM OTHER MISC. BALANCE SHEET EQUATIONS
1140 TASSET.CB=TASSET.C+MEBV+CBASET.L
1150 TASSETS.M=TASSET.C+ASSET.I+ASSET.L
1160 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
1170 TDBT.CB=TDBT.C+LPDBT.I+LPDBT.L
1180 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
1190 TDBT.M=TDBT.C+TDBT.I+TDBT.L
1200 TEQTPOS.CB=TASSET.CB-TDBT.CB
```

```
1210 TEQTPOS.M=TASSETS.M-TDBT.M
1220 INDBT.L=DBT.L*IN.L
1230 INDBT.I=DBT.I*IN.I
1240 INDBT.C=DBT.C*IN.C
1250 CURRATIO=TASSET.C/TDBT.C
1260 GAMMA1S=ASSET.I/(ASSET.L+ASSET.PLR)
1270 ROW.WE0=((ROW.I*GAMMA1S+ROW.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(ROW.I*GAMMA1S*ASSET.LRT+ROW.C*TASSET.C)/(TASSETS.M)
1280 DEL.WE0=((DEL.I*GAMMA1S+DEL.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(DEL.I*GAMMA1S*ASSET.LRT+DEL.C*TASSET.C)/(TASSETS.M)
1290 REM CRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*(TASSETS.M-DBT.C-LEAPAY.C
-DBT.I-DBT.L)-(DBT.C+LEAPAY.C+DBT.I+DBT.L)
1300 CRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*TEQTPOS.M-TDBT.M
1310 CRDRESM.W=((1-ROW.WE0)/ROW.WE0)*TEQTPOS.M-TDBT.M
1320 SUMMINCR=MINCR.C+MINCR.I+MINCR.L
1330 MAXER.W=(CRDRESR.W-SUMMINCR)/((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0+1)
1340 MAXEM.W=(((1-ROW.WE0)*TEQTPOS.M-ROW.WE0*TDBT.M-MAXER.W)-(SUMMINCR/((1-ROW.W
E0)*(1-DEL.WE0)/ROW.WE0+1)))*(1-ROW.WE0)+(SUMMINCR/((1-ROW.WE0)*(1-DEL.WE0)/ROW.
WE0+1))+MAXER.W
1345 PIPMT=CP.I+CP.L+INDBT.I+INDBT.L
1348 CAPINV=ASSETP.IR
1350 RETURN
1360 REM BANKRUPTCY SUBROUTINE
1370 IF (1-ROW.WE0)*TASSETS.M <= TDBT.M OR PAR > P THEN TASSET.C=0:ASSET.I=0:ASS
ET.L=0:TASSETS.M=0:TDBT.C=0:TDBT.I=0:TDBT.L=0:TDBT.M=0:TEQTPOS.M=0:CLS:LOCATE 15
,20:PRINT "SORRY, BUT YOU'RE BANKRUPT ! TRY AGAIN ... ":STOP
1380 RETURN
1390 REM CALCULATE ASSETP.IR
1400 IF FLAG.LENDER=1 THEN 1440
1410 IF PHASE$="M" OR PHASE$="m" THEN ASSETP.IR=(MEMV*INFLA(CYCLE)*DEPRATE)/(1+D
EPRATE):GOTO 1440
1420 INVEST.I=MEMV/((1/DEPRATE)-(((1+DEPRATE)^-TT)/DEPRATE)+1)
1430 TASSETP.IR=INVEST.I*INFLA(CYCLE):ASSETP.IR=TASSETP.IR
1440 RETURN
1450 REM INITIAL BALANCE SHEET CREDIT RESERVE CHECKS
1460 IF CRDRESR.L < MINCR.L THEN GOSUB 2470:REM  CREDIT CHECK
1470 IF CRDRESR.C < (MINCR.C +ASSETP.IR*CASHDP.I) THEN GOTO 1490:REM  CREDIT CHE
CK
1480 GOTO 1750 :REM MACHINERY CREDIT CHECK
1490 VOLLIQMIN.C=(ABS(CRDRESR.C-(MINCR.C+ASSETP.IR*CASHDP.I))/(1-ROW.C))*(1-DEL.
C):IF VOLLIQMIN.C>(TASSET.C-MINRATIO.C*TDBT.C) THEN GOSUB 1650 :REM CHECK FOR RE
FINANCE OPTION W/LONG TERM DEBT
1500 REM UPDATE CURRENT ASSET ACCOUNTS
1510 ASSET.C=ASSET.C-VOLLIQMIN.C
1520 TASSET.C=TASSET.C-VOLLIQMIN.C
1530 DBT.C=DBT.C-(1-ROW.C)*VOLLIQMIN.C
1540 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
1550 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
1560 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
1570 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
1580 CRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
1590 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
1600 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
1610 AVAILASS.CI=AEQTPOS.C-MINEQTPOS.C
1620 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
1630 CURRATIO=TASSET.C/TDBT.C
1640 GOTO 1750: REM MACHINERY CREDIT CHECK
1650 REM TEST FOR REFINANCE OPTION LONG TERM
1660 VOLLIQMIN.C=(ABS(CRDRESR.C-MINCR.C)/(1-ROW.C))*(1-DEL.C)
1670 IF REFINANCE$="N" OR REFINANCE$="n" AND CRDRESR.L>(VOLLIQMIN.C+ASSETP.IR)+5
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00+.05*(VOLLIQMIN.C+ASSETP.IR) THEN GOTO 1680:ELSE GOTO 1740
1680 DBT.L=DBT.L+VOLLIQMIN.C+ASSETP.IR+(500+.05*VOLLIQMIN.C+ASSETP.IR)
1690 ASSET.I=ASSET.I+ASSETP.IR:MEMV=ASSET.I:MECB=MECB+ASSETP.IR:MEBV=MEBV+ASSETP
.IR
1700 ASSET.C=ASSET.C+VOLLIQMIN.C: REM RECALC ?
1710 REFINANCE$="Y":REFINYRS=1
1720 GOSUB 340:REM UPDATE BALANCE SHEET EQUATIONS
1730 GOTO  250:REM BALANCE SHEET FORMAT
1740 IF REFINANCE$="Y" OR REFINANCE$="y" THEN GOTO 2470:REM VOLLIQMIN.L ROUTINE
1750 REM MACHINERY CREDIT RESERVE CHECK AND REQUIRED PURCHASE SUBROUTINE
1760 IF CRDRESR.I<MINCR.I+ASSETP.IR*(1-CASHDP.I) THEN GOTO 1880:REM CALCULATE RE
QASSET.CI
1770 REM CALCULATE AVAILASS.CI
1780 AVAILASS.CI=EQTPOS.C-MINEQTPOS.C
1790 IF CRDRESR.I=>ASSETP.IR*(1-CASHDP.I) THEN GOTO 1800:ELSE GOTO 1840:REM NEGA
TIVE BRANCH
1800 IF AVAILASS.CI=>(CASHDP.I*ASSETP.IR) THEN GOTO 3210:REM POINT #3
1810 IF CRDRESR.C=>(CASHDP.I*ASSETP.IR) THEN GOTO 2920:REM POINT#2
1820 IF REFINANCE$="Y" OR REFINANCE$="y" THEN GOTO 3500:REM POINT #4
1830 IF CRDRESR.L=>ASSETP.IR THEN GOTO 3790:REM POINT#5:ELSE GOTO 2580:REM POINT
#4
1840 IF AVAILASS.CI=>ASSETP.IR-CRDRESR.I THEN GOTO 2600:REM POINT#1
1850 IF CRDRESR.C=>ASSETP.IR-CRDRESR.I THEN GOTO 4500:REM POINT #7
1860 IF REFINANCE$="Y" OR REFINANCE$="y" THEN GOTO 4810:REM POINT #8
1870 IF CRDRESR.L=>ASSETP.IR GOTO 5210:ELSE GOTO 4170:REM PT#9 THEN REM POINT #6
1880 REQASSET.CI=(ABS(CRDRESR.I-MINCR.I))/((1+(1-ROW.I)*(1-DEL.I))/ROW.I)
1890 IF MINEQTPOS.C<EQTPOS.C THEN AVAILASS.CI=EQTPOS.C-MINEQTPOS.C:ELSE AVAILASS
.CI=0:GOTO 1920:REM CALCULATE FOR VOLLIQMIN.I
1900 IF GAMMA2S<GAMMA2 THEN AVAILASS.CI=0:GOTO 1920:REM CALCULATE FOR VOLLIQMIN.
I
1910 IF AVAILASS.CI=>REQASSET.CI THEN GOTO 5620:ELSE GOSUB 5900:REM IF TRUE THEN
 POINT # 10 ELSE POINT #11
1920 REM CALCULATE VOLLIQMIN.I
1930 VOLLLIQMIN.I=ABS(CRDRESR.I-MINCR.I)/((1+GAMMA1S)*(1-ROW.I)*(1-DEL.I))
1940 REM CALCULATE INTERMEDIATE VOLLIQMIN.IL
1950 REM CALCULATE VOLLIQI.L
1960 VOLLIQI.L=(ABS(CRDRESR.I-MINCR.I)-VOLLIQMIN.I*(1-ROW.I)*(1-DEL.I))/(1+((1-R
OW.I)*(1-DEL.I))/ROW.I)
1970 REM CALCULATE VOLLIQMIN.IL
1980 DE.L=DBT.L/EQTPOS.L
1990 VOLLIQMIN.IL=(VOLLIQI.L/(1-ROW.L))*(1+(DE.L)*((1/(1-ROW.L))^DE.L))/(1-ROW.L
)
2000 GOSUB 340:REM BALANCE SHEET UPDATE EQUATIONS
2010 GOSUB 1390:REM RECALULATE TASSETP.IR
2020 GOTO  1450:REM CREDIT RESERVE RE-CHECKS
2030 REM REAL ESTATE CREDIT RESERVE CHECKS
2040 IF CRDRESR.L=>MINCR.L AND CRDRESR.I=>MINCR.I AND VOLLIQMIN.IL=0 THEN REQASS
ET.CL=0:GOTO 6110:REM BALANCE SHEET PRINTOUT
2050 REQASSET.CL=(ABS(CRDRESR.L-MINCR.L))/(1+((1-ROW.L)*(1-DEL.L))/ROW.L)
2060 IF MINEQTPOS.C>EQTPOS.C THEN AVAILASS.CL=EQTPOS.C-MINEQTPOS.C:ELSE AVAILASS
.CL=0:GOTO 2470:REM CALCULATE VOLLIQMIN.L
2070 REM UPDATE ASSET.C AND DBT.L TO RELECT THE USE OF AVAILASS.CL
2080 ASSET.C=ASSET.C-AVAILASS.CL
2090 DBT.L=DBT.L-AVAILASS.CL
2100 IF AVAILASS.CL < REQASSET.CL THEN GOTO 2290
2110 REM RECALCULATE CREDIT RESERVE RESTRICTED.L BASED ON REQASSET.CL
2120 DBT.L=DBT.L-REQASSET.CL
2130 EQTPOS.L=ASSET.L-DBT.L
2140 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
2150 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
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2160 CP.L=(1/TERM.L)*DBT.L
2170 LPDBT.L=DBT.L-CP.L
2180 ASSET.C=ASSET.C-REQASSET.CL
2190 TASSET.C=ASSET.C+PPDLEASE
2200 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
2210 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
2220 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
2230 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
2240 CURRATIO=TASSET.C/TDBT.C
2250 MINEQTPOS.C=(TDBT.C+MINCR.C)/(((1-ROW.C)*(1-DEL.C))/ROW.C)
2260 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
2270 CRDRESR.C=(((1-ROW.C)*(1-DEL.C))/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
2280 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
2290 REM RECALCULATE CREDIT RESERVE RESTRICTED.L BASED ON AVAILASS.CL
2300 DBT.L=DBT.L-AVAILASS.CL
2310 EQTPOS.L=ASSET.L-DBT.L
2320 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
2330 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
2340 CP.L=(1/TERM.L)*DBT.L
2350 LPDBT.L=DBT.L-CP.L
2360 ASSET.C=ASSET.C-AVAILASS.CL
2370 TASSET.C=ASSET.C+PPDLEASE
2380 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
2390 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
2400 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
2410 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
2420 CURRATIO=TASSET.C/TDBT.C
2430 MINEQTPOS.C=(TDBT.C+MINCR.C)/(((1-ROW.C)*(1-DEL.C))/ROW.C)
2440 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
2450 CRDRESR.C=(((1-ROW.C)*(1-DEL.C))/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
2460 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
2470 REM POINT #12
2480 REM CALCULATE VOLLIQMIN.L
2490 VOLLIQMIN.L=(ABS(CRDRESR.L-MINCR.L))/((1+GAMMA1S)*(1-ROW.L)*(1-DEL.L))
2500 REM CALCULATE INTERMEDIATE VOLLIQMIN.LI
2510 REM CALCULATE VOLLIQI.I
2520 VOLLIQI.I=((ABS(CRDRESR.L-MINCR.L))-VOLLIQMIN.L*(1-ROW.L)*(1-DEL.L))/(1+(((
1-ROW.L)*(1-DEL.L))/ROW.L))
2530 REM CALCULATE VOLLIGMIN.LI
2540 DE.I=DBT.I/EQTPOS.I
2550 VOLLIQMIN.LI=((VOLLIQI.I/(1-ROW.I))*(((1+DE.I)*(1/(1-ROW.I))^DE.I))/(1-ROW.
I))
2560 FLAG=12
2570 GOSUB 340:REM GOTO BALANCE SHEET EQUATIONS
2580 GOSUB 1390: REM RECALC REQUIRED MACHINERY PURCHASE
2590 GOTO  1450: REM CREDIT RESERVE RE-CHECKS
2600 REM POINT 1 IF AVAILASS.CI > (ASSETP.IR-CRDRESR.I)
2610 ASSET.I=ASSET.I+ASSETP.IR
2620 TCRDRESR.I=CRDRESR.I
2630 MEMV=ASSET.I
2640 MECB=MECB+ASSETP.IR
2650 MEBV=MEBV+ASSETP.IR
2660 ACCDEP=MECB-MEBV
2670 CCGT.I=(ASSET.I-MEBV)*TAXRATE)
2680 DBT.I=DBT.I+TCRDRESR.I
2690 CP.I=(1/TERM.I)*DBT.I
2700 TDBT.I=LPDBT.I+CCGT.I
2710 LPDBT.I=DBT.I-CP.I
2720 TDBT.I=LPDBT.I+CCGT.I
2730 EQTPOS.I=ASSET.I-DBT.I
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2740 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
2750 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
2760 ASSET.C=ASSET.C-(ASSETP.IR-TCRDRESR.I)
2770 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
2780 DBT.C=DBT.C
2790 TASSET.C=ASSET.C+PPDLEASE
2800 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
2810 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
2820 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
2830 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
2840 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
2850 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
2860 CURRATIO=TASSET.C/TDBT.C
2870 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
2880 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
2890 TCRDRESR.I=0
2900 REM NO EFFECT ON REAL ESTATE ACCOUNTS
2910 FLAG=1:RETURN
2920 REM POINT 2 IF CRDRESR.C >=(CASHDP.I*ASSETP.IR)-AVAILASS.CI
2930 ASSET.I=ASSET.I+ASSETP.IR
2940 MEMV=ASSET.I
2950 MECB=MECB+ASSETP.IR
2960 MEBV=MEBV+ASSETP.IR
2970 ACCDEP=MECB-MEBV
2980 CCGT.I=(ASSET.I-MEBV)*TAXRATE
2990 TDBT.I=LPDBT.I+CCGT.I
3000 DBT.I=DBT.I+ASSETP.IR*(1-CASHDP.I)
3010 CP.I=(1/TERM.I)*DBT.I
3020 LPDBT.I=DBT.I-CP.I
3030 EQTPOS.I=ASSET.I-DBT.I
3040 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
3050 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
3060 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
3070 ASSET.C=ASSET.C
3080 TASSET.C=ASSET.C+PPDLEASE
3090 DBT.C=DBT.C+(ASSETP.IR*CASHDP.I)
3100 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
3110 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
3120 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
3130 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
3140 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
3150 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
3160 CURRATIO=TASSET.C/TDBT.C
3170 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
3180 REM NO EFFECT ON REAL ESTATE ACCOUNTS
3190 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
3200 FLAG=2:RETURN
3210 REM POINT 3 AVAILASS.CI >=(CASHDP.I*ASSETP.IR)
3220 ASSET.I=ASSET.I+ASSETP.IR
3230 MEMV=ASSET.I
3240 MECB=MECB+ASSETP.IR
3250 MEBV=MEBV+ASSETP.IR
3260 ACCDEP=MECB-MEBV
3270 CCGT.I=(ASSET.I-MEBV)*TAXRATE
3280 DBT.I=DBT.I+ASSETP.IR*(1-CASHDP.I)
3290 CP.I=(1/TERM.I)*DBT.I
3300 LPDBT.I=DBT.I-CP.I
3310 TDBT.I=LPDBT.I+CCGT.I
3320 EQTPOS.I=ASSET.I-DBT.I
3330 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
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3340 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
3350 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
3360 ASSET.C=ASSET.C-(ASSETP.IR*CASHDP.I)
3370 TASSET.C=ASSET.C+PPDLEASE
3380 DBT.C=DBT.C
3390 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
3400 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
3410 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
3420 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
3430 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
3440 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
3450 CURRATIO=TASSET.C/TDBT.C
3460 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
3470 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
3480 REM NO EFFECT ON REAL ESTATE ACCOUNTS
3490 FLAG=3:RETURN
3500 REM POINT 4
3510 ASSET.I=ASSET.I+(CRDRESR.C/CASHDP.I)
3520 MEMV=ASSET.I
3530 MECB=MECB+(CRDRESR.C/CASHDP.I)
3540 MEBV=MEBV+(CRDRESR.C/CASHDP.I)
3550 ACCDEP=MECB-MEBV
3560 CCGT.I=(ASSET.I-MEBV)*TAXRATE
3570 DBT.I=DBT.I+(CRDRESR.C/CASHDP.I-CRDRESR.C)
3580 CP.I=(1/TERM.I)*DBT.I
3590 LPDBT.I=DBT.I-CP.I
3600 TDBT.I=LPDBT.I+CCGT.I
3610 EQTPOS.I=ASSET.I-DBT.I
3620 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
3630 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
3640 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
3650 DBT.C=DBT.C+CRDRESR.C
3660 REM DBT.C=DBT.C-(1-ROW.C)*VOLLIQMIN.C
3670 CRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
3680 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
3690 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
3700 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
3710 REM GOTO VOLLIQMIN.L ROUTINE
3720 DE.L=DBT.L/EQTPOS.L
3730 ASSETP.IRP=TCRDRESR.C/CASHDP.I
3740 VOLLIQMIN.IL=((ASSETP.IR-ASSETP.IRP)/(1-ROW.L))*((1+(DE.L)*(1/(1-ROW.L))^DE
.L)/(1-ROW.L))
3750 TCRDRESR.C=0
3760 FLAG=4
3770 GOSUB 7530:RETURN:REM REAL ESTATE ACCOUNT UPDATE EQUATIONS
3780 REM POINT 5
3790 ASSET.I=ASSET.I+ASSETP.IR
3800 MEMV=ASSET.I
3810 MECB=MECB+ASSETP.IR
3820 MEBV=MEBV+ASSETP.IR
3830 ACCDEP=MECB-MEBV
3840 CCGT.I=(ASSET.I-MEBV)*TAXRATE
3850 DBT.I=DBT.I
3860 CP.I=(1/TERM.I)*DBT.I
3870 LPDBT.I=DBT.I-CP.I
3880 TDBT.I=LPDBT.I+CCGT.I
3890 EQTPOS.I=ASSET.I-DBT.I
3900 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
3910 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
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3920 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
3930 ASSET.C=ASSET.C
3940 TASSET.C=ASSET.C+PPDLEASE
3950 DBT.C=DBT.C
3960 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
3970 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
3980 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
3990 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
4000 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
4010 CURRATIO=TASSET.C/TDBT.C
4020 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
4030 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
4040 REM REAL ESTATE ACCOUNT CHANGES
4050 DBT.L=DBT.L+ASSETP.IR*1.05+500
4060 REFINCOST=ASSETP.IR*1.05+500
4070 CP.L=(1/TERM.L)*DBT.L
4080 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
4090 LPDBT.L=DBT.L-CP.L
4100 TDBT.L=LPDBT.L+CCGT.L
4110 EQTPOS.L=ASSET.L-DBT.L
4120 EQTPOSM.L=ASSET.L-DBT.L-CCGT.L
4130 CRDRESR.L=((1-ROW.L)*(1-DEL.L))/ROW.L*EQTPOS.L-DBT.L
4140 CRDRESM.L=(1-ROW.L)/ROW.L*EQTPOSM.L-(DBT.L+CCGT.L)
4150 REFINANCE$="Y":REFINYRS=1
4160 FLAG=5:RETURN
4170 REM POINT #6
4180 ASSET.I=ASSET.I+ASSETP.IR
4190 MEMV=ASSET.I
4200 MECB=MECB+ASSETP.IR
4210 MEBV=MEBV+ASSETP.IR
4220 ACCDEP=MECB-MEBV
4230 CCGT.I=(ASSET.I-MEBV)*TAXRATE
4240 DBT.I=DBT.I+CRDRESR.I
4250 CP.I=(1/TERM.I)*DBT.I
4260 LPDBT.I=DBT.I-CP.I
4270 TDBT.I=LPDBT.I+CCGT.I
4280 EQTPOS.I=ASSET.I-DBT.I
4290 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
4300 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
4310 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
4320 ASSET.C=ASSET.C
4330 TASSET.C=ASSET.C+PPDLEASE
4340 DBT.C=DBT.C
4350 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
4360 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
4370 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
4380 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
4390 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
4400 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
4410 CURRATIO=TASSET.C/TDBT.C
4420 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
4430 DE.L=DBT.L/EQTPOS.L
4440 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
4450 VOLLIQMIN.IL=(ASSETP.IR/(1-ROW.L))*((1+DE.L*((1/(1-ROW.L))^DE.L))/(1-ROW.L)
)
4460 FLAG=6
4470 GOTO 7530:RETURN:REM REAL ESTATE ACCOUNT UPDATE
4480 REM GOTO 620:RETURN
4490 FLAG=6:RETURN
4500 REM POINT 7
```

```
4510 ASSET.I=ASSET.I+ASSETP.IR
4520 MEMV=ASSET.I
4530 MECB=MECB+ASSETP.IR
4540 MEBV=MEBV+ASSETP.IR
4550 ACCDEP=MECB-MEBV
4560 CCGT.I=(ASSET.I-MEBV)*TAXRATE
4570 DBT.I=DBT.I+CRDRESR.I
4580 CP.I=(1/TERM.I)*DBT.I
4590 LPDBT.I=DBT.I-CP.I
4600 TDBT.I=LPDBT.I+CCGT.I
4610 EQTPOS.I=ASSET.I-DBT.I
4620 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
4630 TCRDRESR.I=CRDRESR.I
4640 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
4650 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
4660 REM ASSET.C=ASSET.C
4670 TASSET.C=ASSET.C+PPDLEASE
4680 DBT.C=DBT.C+(ASSETP.IR-TCRDRESR.I)
4690 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
4700 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
4710 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
4720 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
4730 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
4740 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
4750 CURRATIO=TASSET.C/TDBT.C
4760 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
4770 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
4780 TCRDRESR.I=0
4790 REM NO EFFECT ON REAL ESTATE ACCOUNT
4800 FLAG=7:RETURN
4810 REM POINT #8
4820 IF CRDRESR.I => ( CRDRESR.C/CASHDP.I-CRDRESR.C ) THEN ASSETP.IRP=CRDRESR.C/
CASHDP.I : ELSE ASSETP.IRP=CRDRESR.I/(1-CASHDP.I)
4830 ASSET.I=ASSET.I+ASSETP.IR
4840 TCRDRESR.I=CRDRESR.I
4850 MEMV=ASSET.I
4860 MECB=MECB+ASSETP.IR
4870 MEBV=MEBV+ASSETP.IR
4880 ACCDEP=MECB-MEBV
4890 CCGT.I=(ASSET.I-MEBV)*TAXRATE
4900 TDBT.I=LPDBT.I+CCGT.I
4910 IF TCRDRESR.I.>= ((CRDRESR.C/CASHDP.I)-CRDRESR.C) THEN DBT.I=DBT.I+((CRDRES
R.C/CASHDP.I)-CRDRESR.C):ELSE DBT.I=DBT.I+TCRDRESR.I
4920 REM DBT.I=DBT.I+CRDRESR.I
4930 CP.I=(1/TERM.I)*DBT.I
4940 LPDBT.I=DBT.I-CP.I
4950 TDBT.I=LPDBT.I+CCGT.I
4960 EQTPOS.I=ASSET.I-DBT.I
4970 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
4980 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
4990 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
5000 ASSET.C=ASSET.C
5010 TASSET.C=ASSET.C+PPDLEASE
5020 IF TCRDRESR.I>=((CRDRESR.C/CASHDP.I)-CRDRESR.C) THEN DBT.C=DBT.C+CRDRESR.C:
ELSE DBT.C=DBT.C+((TCRDRESR.I/(1-CASHDP.I))*CASHDP.I)
5030 REM DBT.C=DBT.C+(ASSETP.IRP*CASHDP.I)
5040 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
5050 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
5060 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
5070 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
```

```
5080 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
5090 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
5100 CURRATIO=TASSET.C/TDBT.C
5110 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
5120 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
5130 TCRDRESR.I=0
5140 REM CALCULATE VOLLIQMIN.IL
5150 DE.L=DBT.L/EQTPOS.L
5160 VOLLIQMIN.IL=((ASSETP.IR-ASSETP.IRP)/(1-ROW.L))*(1+DE.L*((1/(1-ROW.L))^DE.L
)/(1-ROW.L))
5170 STOP
5180 REM IF VOLLIQMIN.IL>0 GOTO 200: REM UPDATE REAL ESTATE VALUES AFTER THE SAL
E
5190 FLAG=8
5200 GOTO 7530:RETURN: REM REAL ESTATE UPDATE EQUATIONS
5210 REM POINT #9
5220 TCRDRESR.I=CRDRESR.I
5230 ASSET.I=ASSET.I+ASSETP.IR
5240 MEMV=ASSET.I
5250 MECB=MECB+ASSETP.IR
5260 MEBV=MEBV+ASSETP.IR
5270 ACCDEP=MECB-MEBV
5280 CCGT.I=(ASSET.I-MEBV)*TAXRATE
5290 DBT.I=DBT.I+CRDRESR.I
5300 CP.I=(1/TERM.I)*DBT.I
5310 LPDBT.I=DBT.I-CP.I
5320 TDBT.I=LPDBT.I+CCGT.I
5330 EQTPOS.I=ASSET.I-DBT.I
5340 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
5350 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
5360 CRDRESM.I=(1-ROW.I)/ROW.I*EQTPOSM.I-(DBT.I+CCGT.I)
5370 ASSET.C=ASSET.C
5380 TASSET.C=ASSET.C+PPDLEASE
5390 DBT.C=DBT.C
5400 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
5410 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
5420 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
5430 CRDRESR.C=((1-ROW.C)*(1-DEL.C))/ROW.C*EQTPOS.C-(DBT.C+LEAPAY.C)
5440 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
5450 CURRATIO=TASSET.C/TDBT.C
5460 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
5470 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
5480 DBT.L=DBT.L+(ASSETP.IR-TCRDRESR.I)*1.05+500
5490 REFINCOST=(ASSETP.IR-TCRDRESR.I)*1.05+500
5500 CP.L=(1/TERM.L)*DBT.L
5510 LPDBT.L=DBT.L-CP.L
5520 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
5530 TDBT.L=LPDBT.L+CCGT.L
5540 EQTPOS.L=ASSET.L-DBT.L
5550 EQTPOSM.L=ASSET.L-DBT.L-CCGT.L
5560 CRDRESR.L=(((1-ROW.L)*(1-DEL.L))/ROW.L)*EQTPOS.L-DBT.L
5570 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
5580 DE.L=DBT.L/EQTPOS.L
5590 TCRDRESR.I=0
5600 REFINANCE$="Y":REFINYRS=1
5610 FLAG=9:RETURN
5620 REM POINT #10
5630 ASSET.I=ASSET.I
5640 MEMV=ASSET.I
5650 DBT.I=DBT.I-REQASSET.CI
```

```
5660 MEBV=MEBV
5670 ACCDEP=MECB-MEBV
5680 CCGT.I=(ASSET.I-MEBV)*TAXRATE
5690 CP.I=(1/TERM.I)*DBT.I
5700 LPDBT.I=DBT.I-CP.I
5710 TDBT.I=LPDBT.I+CCGT.I
5720 EQTPOS.I=ASSET.I-DBT.I
5730 EQTPOSM.I=ASSET.I-DBT.I+CCGT.I
5740 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
5750 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
5760 CRDRESM.I=((1-ROW.I)/ROW.I)*EQTPOSM.I-(DBT.I+CCGT.I)
5770 ASSET.C=ASSET.C-REQASSET.CI
5780 TASSET.C=ASSET.C+PPDLEASE
5790 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
5800 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
5810 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
5820 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
5830 MINEQTPOS.C=(TDBT.C+MINCR.C)/(((1-ROW.C)*(1-DEL.C))/ROW.C)
5840 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
5850 CRDRESR.C=(((1-ROW.C)*(1-DEL.C))/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
5860 CRDRESM.C=(1-ROW.C)/ROW.C*EQTPOSM.C-(DBT.C+LEAPAY.C)
5870 CURRATIO=TASSET.C/TDBT.C
5880 FLAG=10:REM "RETURN" SHUT OFF FOR TESTING
5890 GOTO 1790:REM HAVING BROUGHT THE CRDRESR.I INTO BAL. GO BACK TO CAL ASSETP.
IR
5900 REM POINT #11
5910 DBT.I=DBT.I-AVAILASS.CI
5920 EQTPOS.I=ASSET.I-DBT.I
5930 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
5940 CRDRESR.I=(((1-ROW.I)*(1-DEL.I))/ROW.I)*EQTPOS.I-DBT.I
5950 CRDRESM.I=((1-ROW.I)/ROW.I)*EQTPOSM.I-(DBT.I+CCGT.I)
5960 CP.I=(1/TERM.I)*DBT.I
5970 LPDBT.I=DBT.I-CP.I
5980 TDBT.I=DBT.I+CCGT.I
5990 ASSET.C=ASSET.C-AVAILASS.CI
6000 TASSET.C=ASSET.C+PPDLEASE
6010 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
6020 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
6030 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
6040 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
6050 MINEQTPOS.C=(TDBT.C+MINCR.C)/(((1-ROW.C)*(1-DEL.C))/ROW.C)
6060 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
6070 CRDRESR.C=(((1-ROW.C)*(1-DEL.C))/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
6080 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
6090 CURRATIO=ASSET.C/TDBT.C
6100 FLAG=11:RETURN
6110 REM INITIAL BALANCE SHEET OUTPUT SUBROUTINE
6120 CLS:KEY OFF
6130 IF AO < > 0 THEN AO=ASSET.L/VALPAO
6135 CDATE=YEAR-1
6139 CLS
6140 PRINT TAB(1);"INITIAL BALANCE SHEET: DECEMBER 31,";TAB(37);:PRINT USING "##
##";CDATE;:PRINT TAB(50);"PAGE 1"
6150 PRINT TAB(1);"ASSETS";TAB(40);"MODIFIED COST";TAB(65);"MARKET VALUE":PRINT
6160 PRINT TAB(1);"CURRENT ASSETS"
6170 PRINT TAB(3);"- Cash / Cash Equivalent";TAB(40);:PRINT USING "$$######,###"
;ASSET.C;:PRINT TAB(65);:PRINT USING "$$######,###";ASSET.C
6180 PRINT TAB(3);"- Prepaid Land Lease";TAB(40);:PRINT USING"$$######,###";PPDL
EASE;:PRINT TAB(65);:PRINT USING "$$######,###";PPDLEASE
6190 PRINT TAB(1);"TOTAL CURRENT ASSETS";TAB(40);:PRINT USING "$$######,###";TAS
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SET.C;:PRINT TAB(65);:PRINT USING "$$######,###";TASSET.C
6200 PRINT:PRINT TAB(1);"INTERMEDIATE ASSETS"
6210 PRINT TAB(3);"- Machinery and Bldg"
6220 PRINT TAB(8);"- Cost";TAB(30);:PRINT USING "$$######,###";MECB;:PRINT TAB(6
5);:PRINT USING "$$######,###";ASSET.I
6230 PRINT TAB(8);"- Acc. Dep.";TAB(30);:PRINT USING "$$######,###";ACCDEP
6240 PRINT TAB(8);"- Book Value";TAB(40);:PRINT USING "$$######,###";MEBV
6250 PRINT TAB(1);"TOTAL INTERMEDIATE ASSETS";TAB(40);:PRINT USING "$$######,###
";MEBV;:PRINT TAB(65);: PRINT USING "$$######,###";ASSET.I
6260 PRINT:PRINT TAB(1);"LAND (acres=";INT(AO);")";TAB(40);:PRINT USING"$$######
,###";CBASET.L;:PRINT TAB(65);: PRINT USING "$$######,###";ASSET.L
6270 PRINT:PRINT TAB(1);"TOTAL VALUE OWNED ASSETS";TAB(40);:PRINT USING "$$#####
#,###";TASSET.CB;:PRINT TAB(65);:PRINT USING"$$######,###";TASSETS.M
6280 PRINT:PRINT TAB(1);"VALUE OF RENTED LAND (acres=";INT(AR);")";TAB(47);"N/A"
;TAB(65);:PRINT USING "$$######,###";ASSET.PLR
6290 PRINT:PRINT TAB(1);"TOTAL VALUE OF RENTED & OWNED ASSETS";TAB(40);:PRINT US
ING "$$######,###";(TASSET.CB);:PRINT TAB(65);:PRINT USING "$$######,###";(ASSET
.PLR+TASSETS.M)
6300 REM PRINT:PRINT "TO CONTINUE PRESS < C >";
6301 LOCATE 24,28:PRINT"To Continue Press < C >";
6310 IF INKEY$ < > "C" THEN 6310
6320 CLS
6330 PRINT TAB(1);"INITIAL BALANCE SHEET: DECEMBER 31,";TAB(37);:PRINT USING "##
##";CDATE;:PRINT TAB(50);"PAGE 2"
6340 PRINT TAB(1);"LIABILITIES AND NET WORTH";TAB(40);"MODIFIED COST";TAB(65);"M
ARKET VALUE"
6350 PRINT TAB(1);"CURRENT LIABILITIES"
6360 PRINT TAB(3);"- Operating loan (12 mo or less)";TAB(40);:PRINT USING "$$###
###,###";DBT.C;:PRINT TAB(65);:PRINT USING "$$######,###";DBT.C
6370 PRINT TAB(3);"- Current Port. Inter. Debt";TAB(40);:PRINT USING "$$######,#
##";CP.I;:PRINT TAB(65);:PRINT USING "$$######,###";CP.I
6380 PRINT TAB(3);"- Current Port. Long-Term Debt";TAB(40);:PRINT USING "$$#####
#,###";CP.L;:PRINT TAB(65);:PRINT USING "$$######,###";CP.L
6390 PRINT TAB(3);"- Land Lease Payable";TAB(40);:PRINT USING "$$######,###";LEA
PAY.C;:PRINT TAB(65);:PRINT USING "$$######,###";LEAPAY.C
6400 PRINT TAB(1);"TOTAL CURRENT LIABILITIES";TAB(40);:PRINT USING "$$######,###
";TDBT.C;:PRINT TAB(65);:PRINT USING"$$######,###";TDBT.C
6410 PRINT:PRINT TAB(1);"INTERMEDIATE LIABILITIES"
6420 PRINT TAB(3);"- Machinery/Bldg Loan";TAB(40);:PRINT USING "$$######,###";LP
DBT.I;:PRINT TAB(65);:PRINT USING "$$######,###";LPDBT.I
6430 PRINT TAB(3);"- Contingent Tax on Inter. Assets";TAB(47);"N/A";TAB(65);:PRI
NT USING "$$######,###";CCGT.I
6440 PRINT TAB(1);"TOTAL INTERMEDIATE LIABILITIES";TAB(40);:PRINT USING "$$#####
#,###";LPDBT.I;:PRINT TAB(65);:PRINT USING "$$######,###";TDBT.I
6450 PRINT:PRINT TAB(1);"LONG-TERM LIABILITIES"
6460 PRINT TAB(3);"- Real Estate Mortgage";TAB(40);:PRINT  USING"$$######,###";L
PDBT.L;:PRINT TAB(65);:PRINT USING"$$######,###";LPDBT.L
6470 PRINT TAB(3);"- Contingent Tax on Land";TAB(47);"N/A";TAB(65);:PRINT USING"
$$######,###";CCGT.L
6480 PRINT TAB(1);"TOTAL LONG-TERM LIABILITIES";TAB(40);:PRINT USING "$$######,#
##";LPDBT.L;:PRINT TAB(65);:PRINT USING "$$######,###";TDBT.L
6490 PRINT:PRINT TAB(1);"TOTAL LIABILITIES";TAB(40);:PRINT USING "$$######,###";
TDBT.CB;:PRINT TAB(65);:PRINT USING"$$######,###";TDBT.M
6500 PRINT:PRINT TAB(1);"NET WORTH";TAB(40);:PRINT USING"$$######,###";TEQTPOS.C
B;:PRINT TAB(65);:PRINT USING"$$######,###";TEQTPOS.M
6505 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:
LOCATE 20,15: PRINT S39$;S20$
6506 IF A$="C" OR A$="c" THEN GOTO 6530:ELSE GOTO 6507
6507 IF A$="B" OR A$="b" THEN GOTO 6139:ELSE 6505
6510 REM PRINT"TO CONTINUE PRESS < C >";
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```
6520 REM IF INKEY$ < >"C" THEN 6520
6530 CLS
6540 PRINT TAB(1);"INITIAL BALANCE SHEET: DECEMBER 31,";TAB(37);:PRINT USING "##
##";CDATE;:PRINT TAB(50);"PAGE 3"
6550 PRINT : PRINT : PRINT TAB(23);"CREDIT RESERVE SUMMARY INFORMATION":PRINT:PR
INT:PRINT
6560 PRINT USING "       MAXER.W        $$######,###                MAXEM.W
 $$######,###";MAXER.W;MAXEM.W:PRINT
6570 PRINT:PRINT USING "       CRDRESR.C      $$######,###                CRDRESM.
C    $$######,###";CRDRESR.C;CRDRESM.C
6580 PRINT:PRINT USING "       CRDRESR.I      $$######,###                CRDRESM.
I      $$######,###";CRDRESR.I;CRDRESM.I
6590 PRINT:PRINT USING "       CRDRESR.L      $$######,###                CRDRESM.
L      $$######,###";CRDRESR.L;CRDRESM.L
6600 PRINT:PRINT:PRINT USING "       CRDRESR.W      $$######,###                CR
DRESM.W      $$######,###";CRDRESR.W;CRDRESM.W
6604 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:
LOCATE 20,15: PRINT S39$;S20$
6605 IF A$="C" OR A$="c" THEN GOTO 6630:ELSE GOTO 6606
6606 IF A$="B" OR A$="b" THEN GOTO 6320:ELSE 6604
6610 REM LOCATE 23,30:PRINT "PRESS < C > TO CONTINUE";
6620 IF INKEY$ < > "C" THEN 6620
6630 RETURN
6640 REM LENDER DECISION SUBROUTINE
6650 CLS:WIDTH 80:PRINT:PRINT:PRINT TAB(20);:COLOR 15:PRINT "LENDER DECISION  :
 MARKET VALUE BASIS":COLOR 7:PRINT:PRINT:PRINT
6660 REM SET CURSOR CONTROLS
6670 INI.X=CSRLIN:INI.Y=POS(0):FLAG.LENDER=0:GOTO 7100
6680 IF FLAG0=1 THEN ROW.C=VAL(I$)/100
6690 PRINT" ROW.C     = ";USING "   ##.## % ";ROW.C*100;:PRINT S5$;:RETURN
6700 IF FLAG0=1 THEN ROW.I=VAL(I$)/100
6710 PRINT" ROW.I     = ";USING "   ##.## % ";ROW.I*100;:PRINT S5$;:RETURN
6720 IF FLAG0=1 THEN ROW.L=VAL(I$)/100
6730 PRINT" ROW.L     = ";USING "   ##.## % ";ROW.L*100:RETURN
6740 IF FLAG0=1 THEN DEL.C=VAL(I$)/100
6750 PRINT" DEL.C     = ";USING "   ##.## % ";DEL.C*100;:PRINT S5$;:RETURN
6760 IF FLAG0=1 THEN DEL.I=VAL(I$)/100
6770 PRINT" DEL.I     = ";USING "   ##.## % ";DEL.I*100;:PRINT S5$;:RETURN
6780 IF FLAG0=1 THEN DEL.L=VAL(I$)/100
6790 PRINT" DEL.L     = ";USING "   ##.## % ";DEL.L*100:RETURN
6800 IF FLAG0=1 THEN IN.C=VAL(I$)/100
6810 PRINT" IN.C      = ";USING "   ##.## % ";IN.C*100;:PRINT S5$;:RETURN
6820 IF FLAG0=1 THEN IN.I=VAL(I$)/100
6830 PRINT" IN.I      = ";USING "   ##.## % ";IN.I*100;:PRINT S5$;:RETURN
6840 IF FLAG0=1 THEN IN.L=VAL(I$)/100
6850 PRINT" IN.L      = ";USING "   ##.## % ";IN.L*100:RETURN
6860 IF FLAG0=1 THEN MINCR.C=VAL(I$)
6870 PRINT" MINCR.C   = ";USING "$$####,### ";MINCR.C;:PRINT S5$;:RETURN
6880 IF FLAG0=1 THEN MINCR.I=VAL(I$)
6890 PRINT" MINCR.I   = ";USING "$$####,### ";MINCR.I;:PRINT S5$;:RETURN
6900 IF FLAG0=1 THEN MINCR.L=VAL(I$)
6910 PRINT" MINCR.L   = ";USING "$$####,### ";MINCR.L:RETURN
6920 IF FLAG0=1 THEN CASHDP.C=VAL(I$)/100
6930 PRINT" CASHDP.C  = ";USING "   ##.## % ";CASHDP.C*100;:PRINT S5$;:RETURN
6940 IF FLAG0=1 THEN CASHDP.I=VAL(I$)/100
6950 PRINT" CASHDP.I  = ";USING "   ##.## % ";CASHDP.I*100;:PRINT S5$;:RETURN
6960 IF FLAG0=1 THEN CASHDP.L=VAL(I$)/100
6970 PRINT" CASHDP.L  = ";USING "   ##.## % ";CASHDP.L*100;:PRINT:RETURN
6980 IF FLAG0=1 THEN TERM.C=VAL(I$)
6990 PRINT" TERM.C    = ";USING "   ##.#    ";TERM.C;:PRINT S5$;:RETURN
```

```
7000 IF FLAG0=1 THEN TERM.I=VAL(I$)
7010 PRINT" TERM.I    = ";USING "    ##.#     ";TERM.I;:PRINT S5$;:RETURN
7020 IF FLAG0=1 THEN TERM.L=VAL(I$)
7030 PRINT" TERM.L    = ";USING "    ##.#     ";TERM.L;:PRINT:RETURN
7040 IF FLAG0=1 THEN MINRATIO.C=VAL(I$)
7050 PRINT" MINRAT.C  = ";USING "     #.##    ";MINRATIO.C;:PRINT S5$;:RETURN
7060 IF FLAG0=1 THEN DUMMY.C=VAL(I$)
7070 PRINT"             ";"              ";:PRINT S5$;:RETURN
7080 IF FLAG0=1 THEN DUMMY.C=VAL(I$)
7090 PRINT"             ";"              ";:PRINT:RETURN
7100 Y=0
7110 FOR I=1 TO 3:Y=Y+1
7120 ON Y GOSUB 6690, 6710, 6730, 6750, 6770, 6790, 6810, 6830, 6850,  6870, 689
0, 6910,6930,6950,6970,6990,7010,7030,7050,7070,7090
7130 NEXT I
7140 PRINT
7150 IF Y<> 21 THEN 7110
7160 LOCATE 23,1:PRINT S79$;:LOCATE 23,25:INPUT"DO YOU WANT TO MAKE ANY CHANGES
";D$:IF D$="n" OR D$="N" THEN COLOR 7,0:RETURN:ELSE FLAG.LENDER=1
7170 JLOOP=1:NEW.X=INI.X:NEW.Y=INI.Y:L=0
7180 IF JLOOP>7 THEN 7160
7190 IF JLOOP>1 THEN L=L+3
7200 LOCATE NEW.X,NEW.Y:COLOR 0,7
7210 FOR K=1 TO 3
7220 ON K+L GOSUB 6690, 6710, 6730, 6750, 6770, 6790, 6810, 6830, 6850, 6870, 68
90, 6910,6930,6950,6970,6990,7010,7030,7050,7070,7090
7230 NEXT K
7240 COLOR 7,0
7250 LOCATE 23,1:PRINT S79$;:LOCATE 23,20:INPUT"DO YOU WANT TO MAKE ANY CHANGES
ON THIS LINE ";D$
7260 LOCATE NEW.X,NEW.Y
7270 FOR K=1 TO 3
7280 ON K+L GOSUB 6690, 6710, 6730, 6750, 6770, 6790, 6810, 6830, 6850, 6870, 68
90, 6910,6930,6950,6970,6990,7010,7030,7050,7070,7090
7290 NEXT K
7300 IF D$="N" OR D$="n" THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):JLOOP=JLOOP+1:GOTO 718
0
7310 FOR I=L+1 TO L+3
7320 IF I=20 THEN 7160
7330 COLOR 0,7
7340 LOCATE NEW.X,NEW.Y
7350 OLD.X=NEW.X:OLD.Y=NEW.Y
7360 ON I GOSUB  6690, 6710, 6730, 6750, 6770, 6790, 6810, 6830, 6850, 6870, 689
0, 6910,6930,6950,6970,6990,7010,7030,7050,7070,7090
7370 IF I=L+3 THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):ELSE NEW.X=CSRLIN:NEW.Y=POS(0)
7380 LOCATE 23,1
7390 COLOR 7,0:PRINT S79$:COLOR 0,7
7400 LOCATE 23,23:PRINT S39$;:LOCATE 23,24
7410 FLAGC=1
7420 ON I GOSUB 6690, 6710, 6730, 6750, 6770, 6790, 6810, 6830, 6850, 6870, 6890
, 6910,6930,6950,6970,6990,7010,7030,7050,7070,7090
7430 LOCATE 23,47:INPUT" => ",I$
7440 IF LEN(I$)=0 THEN FLAG0=0:ELSE FLAG0=1
7450 COLOR 7,0:LOCATE 22,1:PRINT S79$
7460 LOCATE OLD.X,OLD.Y
7470 ON I GOSUB 6680, 6700, 6720, 6740, 6760, 6780, 6800, 6820, 6840, 6860, 6880
, 6900,6920,6940,6960,6980,7000,7020,7040,7060,7080
7480 FLAG0=0
7490 NEXT I
7500 JLOOP=JLOOP+1:GOTO 7180
```

```
7510 REM REAL ESTATE ACCOUNTS UPDATE FOR POINTS 4,6,8
7520 REM REAL ESTATE ACCOUNTS UPDATE
7530 REM UPDATE THE CBASET.L ACCOUNT
7540 VOLLCB.L=(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.L+LIQSHT+VOLLRES)/ASSETP.L(PAR)
7550 IF VOLLCB.L=0 THEN GOTO 7590
7560 IF VOLLCB.L>1 THEN 7770
7570 SUMRED=SUMRED+VOLLCB.L
7580 IF SUMRED>=1 THEN GOTO 7650:REM CALCULATE LIQSHT
7590 REM UPDATE THE CBASET.L ACCOUNT
7600 CBASE.L(PAR)=CBASE.L(PAR)*(1-SUMRED)
7610 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
7620 ASSETP.L(PAR)=ASSETP.L(PAR)*(1-SUMRED)
7630 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
7640 GOTO 7860:REM CONTINUE REAL ESTATE UPDATE CALCULATIONS
7650 REM CALCULATE LIQSHT
7660 LIQSHT=(SUMRED-1)*ASSETP.L(PAR)
7670 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
7680 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
7690 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
7700 VALPAO=ASSET.L/(AO):REM VALUE PER ACRE OWNED
7710 REM BANKRUPTCY TEST
7720 PAR=PAR+1
7730 IF PAR>P THEN GOSUB 1360: REM BANKRUPTCY SUBROUTINE
7740 REM GO BACK TO CALC NEW VOLLCB.L
7750 GOTO 7540
7760 REM ROUTINE FOR VOLLCB.L>1
7770 REM CALCULATE VOLLRES
7780 VOLLRES=(VOLLIQMIN.L+VOLLIQMIN.IL)-ASSETP.L(PAR)
7790 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
7800 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
7810 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
7820 PAR=PAR+1
7830 IF PAR>P THEN GOSUB 1360: REM BANKRUPTCY SUBROUTINE
7840 REM CALCULATE NEW VOLLCB.L
7850 GOTO 7540 : REM RECALC VOLLCB.L
7860 REM CONTINUE WITH REAL ESTATE EQUATIONS
7870 CCGT.L =(ASSET.L-CBASET.L)*TAXRATE
7880 DBT.L=DBT.L-(VOLLIQMIN.IL-(ROW.L*VOLLIQMIN.IL)-VOLLIQI.L)
7890 CP.L=(1/TERM.L)*DBT.L
7900 LPDBT.L=DBT.L-CP.L
7910 TDBT.L=LPDBT.L+CCGT.L
7920 EQTPOS.L=ASSET.L-DBT.L
7930 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
7940 DE.L=DBT.L/EQTPOS.L
7950 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
7960 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
7970 RETURN
7980 REM ROUTINE TO BUILD LAMDA FILE
7990 E=2.7182818281#:SEARCH=0:TEST=.0000001:I=0:O.LAMDA=.0000001:INC.LAMDA=.0000
05
8000 LAMDA=O.LAMDA
8010 SEARCH=2*E^(-.75*TEQTPOS.M*LAMDA)-(E^(-.5*TEQTPOS.M*LAMDA))+E^(-1.5*TEQTPOS
.M*LAMDA)
8020 REM LOCATE 10,20:PRINT USING " TEQTPOS.M = ######,###   TEST = #.## ";TEQTP
OS.M,TEST
8030 REM LOCATE 12,10:PRINT"LAMDA =";LAMDA:LOCATE 12,40:PRINT "SEARCH =";SEARCH
8040 IF ABS(SEARCH) > TEST THEN LAMDA=LAMDA+INC.LAMDA:GOTO 8010:ELSE RETURN
```

```
1 REM $INCLUDE: 'MODCOM'
10 REM ***************          MODULE No. 3        ***************
20 REM *************** DATE LAST UPDATED 11/24/88 ***************
30 REM *************** DATE LAST PRINTED 12/02/88 ***************
40 REM *************** TIME LAST PRINTED 04:30 PM ***************
180   GOSUB 300:REM      1987 CROP YIELD DATA SUBROUTINE
190   GOSUB 470:REM      1988 PRODUCTION COST BUDGET SUBROUTINE
200   GOSUB 670:REM      CORN & SOYBEAN CASH VARIABLE BUDGET INPUT SUBROUTINE
210   GOSUB 1110:REM     TOTAL CASH FIXED EXPENSE INPUT SUBROUTINE
220   GOSUB 1300:REM     COMMODITY PRICING SUBROUTINE
230   GOSUB 1830:REM     INSURANCE PROGRAM SUBROUTINE
240   GOSUB 2090:REM     INSURANCE CALCULATION SUBROUTINE
250   GOSUB 2730:REM     ALL-RISK INSURANCE TABLE SUBROUTINE
260   GOSUB 3250:REM     CROP MIX SELECTION SUBROUTINE
270   GOSUB 3510:REM     COMMODITY MARKETING STRATEGY SUBROUTINE
280  GOSUB 3740:REM     SUMMARY INFORMATION TABLE SUBROUTINE
285 CLS:LOCATE 9,27:PRINT "Model Now Loading Module No. 4"
290 BEEP:LOCATE 11,30:PRINT "One Moment Please ...":CHAIN"MOD4",,ALL
300 REM 1987 CROP YIELD DATA SUBROUTINE
310 IF CYCLE > 1 THEN WIDTH 40:RETURN
320 CLS:WIDTH 40
330       PRINT"   This program  maintains a data"
340 PRINT:PRINT"file with  yield and  price forecasts"
350 PRINT:PRINT"for  corn   and   soybeans   in  your"
360 PRINT:PRINT"geographical area, as well as related"
370 PRINT:PRINT"production expense budgets."
380 PRINT:PRINT:PRINT"    At this time , please  enter  your"
390 PRINT:PRINT"1987  yield  ( bushel per acre )  for  "
400 PRINT :PRINT :PRINT TAB(5);"CORN     : ";TAB(15);PCY(5);TAB(20);"BU/ACRE"
410 PRINT:PRINT TAB(5);"SOYBEANS: ";TAB(15);PSY(5);TAB(20);"BU/ACRE"
420 GOTO 450:X=CSRLIN-3
430 LOCATE X,28:PRINT S10$;:LOCATE X,28:INPUT" => ",A$:IF A$<>"" THEN LOCATE X,1
5:PRINT USING"###";VAL(A$);:PRINT TAB(20);"BU/ACRE";S10$:PCY(5)=VAL(A$):ELSE LOC
ATE X,20:PRINT"BU/ACRE";S10$;
440 X=X+2:LOCATE X,28:PRINT S10$;:LOCATE X,28:INPUT" => ",A$:IF A$<>"" THEN LOCA
TE X,15:PRINT USING"###";VAL(A$);:PRINT TAB(20);"BU/ACRE";S10$:PSY(5)=VAL(A$):EL
SE LOCATE X,20:PRINT"BU/ACRE";S10$;
450 LOCATE 23,1:PRINT S39$;:LOCATE 23,3:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?"
;
452 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 452
454 D=INSTR(DEE$,D$):IF D<4 THEN 460:ELSE LOCATE 23,1:PRINT S39$;:X=CSRLIN-6:GOT
O 430
460 RETURN
470 REM 1988 YIELD INPUT SUBROUTINE
480 CLS:PRINT TAB(8);"BUDGETED YIELD SELECTION":PRINT
490 PRINT:PRINT"     Select  the yield  for budgeting"
500 PRINT:PRINT" purposes that reflects your expected"
510 PRINT:PRINT YEAR;" yield ( bushels per acre ) ."
520 PRINT:PRINT:PRINT"     You will have the opportunity to"
530 PRINT:PRINT" adjust  the  cash expense figures to"
540 PRINT:PRINT" reflect your  individual  situation.":PRINT
550 PRINT:PRINT TAB(2);"CORN     :";INT(YLDC);TAB(16);"BU/ACRE";TAB(24);"( 80";TA
B(29);"100";TAB(34);"120 )":PRINT
560 PRINT TAB(2);"SOYBEANS:";INT(YLDS);TAB(16);"BU/ACRE";TAB(24);"( 25";TAB(30);
"30";TAB(35);"40 )"
570 GOTO 640
580 LOCATE X,16:PRINT S7$;:LOCATE X,16:INPUT "=> ",A$:IF A$<>"" THEN CYLD=VAL(A$
):LOCATE X,12:PRINT USING"###";CYLD;:PRINT TAB(16);"BU/ACRE";:ELSE LOCATE X,16:P
RINT "BU/ACRE"
```

```
590 IF CYLD=80 THEN C=1:ELSE IF CYLD=100 THEN C=2:ELSE IF CYLD=120 THEN C=3:ELSE
 LOCATE 23,1:PRINT"CHOOSE ONLY ONE OF THE VALUES DISPLAYED":GOTO 580
600 LOCATE 23,1:PRINT S39$
610 X=X+2
620 LOCATE X,16:PRINT S7$;:LOCATE X,16:INPUT "=> ",A$:IF A$<>"" THEN SYLD=VAL(A$
):LOCATE X,12:PRINT USING"###";SYLD;:PRINT TAB(16);"BU/ACRE";:ELSE LOCATE X,16:P
RINT "BU/ACRE"
630 IF SYLD=25 THEN S=1:ELSE IF SYLD=30 THEN S=2:ELSE IF SYLD=40 THEN S=3:ELSE L
OCATE 23,1:PRINT"CHOOSE ONLY ONE OF THE VALUES DISPLAYED":GOTO 620
640 LOCATE 23,1:PRINT S39$;:LOCATE 23,4:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?"
;
642 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN GOTO 642
644 D=INSTR(DEE$,D$):IF D<4 THEN GOTO 650:ELSE X=CSRLIN-5:GOTO 580
650 IF TOTA<100 THEN ACRES=1:ELSE IF TOTA<180 THEN ACRES=2:ELSE IF TOTA<260 THEN
 ACRES=3:ELSE IF TOTA<500 THEN ACRES=4:ELSE IF TOTA<1000 THEN ACRES=5:ELSE ACRES
=6
660 RETURN
670 REM CROP BUDGET SUBROUTINE
680 CLS:WIDTH 80:LOCATE ,,0
690 PRINT:PRINT TAB(29);"CROP BUDGET : CORN":PRINT:PRINT TAB(10);"CASH VARIABLE
EXPENSES PER ACRE FOR A YIELD OF ";CYLD;" BUSHELS":PRINT
700 SUMCCVE=0:SUMSCVE=0
710 FOR I=1 TO 12
720 CCVE(C,I)=CCVE(C,I)*CUMINFLA(CYCLE)
730 PRINT TAB(15);CVE$(I);TAB(45);:PRINT USING "$$###.##";CCVE(C,I)
740 SUMCCVE=SUMCCVE+CCVE(C,I)
750 NEXT I
760 PRINT TAB(44);DASH$;DASH$:PRINT:PRINT TAB(15);"TOTAL . . .";TAB(43);:PRINT U
SING "$$#,###.##";SUMCCVE
770 LOCATE 23,1:PRINT S79$;:LOCATE 23,15,1:PRINT"DO YOU WANT TO ENTER IN YOUR OW
N VALUES ?";
780 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN GOTO 780
782 D=INSTR(DEE$,D$):IF D < 4 THEN 870:ELSE LOCATE 23,1:PRINT S79$;:GOTO 810
790 LOCATE 23,1:PRINT S79$;:LOCATE 23,24:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?
";
792 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN GOTO 792
800 D=INSTR(DEE$,D$):IF D < 4 THEN 870:ELSE LOCATE 23,1:PRINT S79$;:GOTO 810
810 X=CSRLIN-17
820 FOR I=1 TO 12
830 LOCATE X,57:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,45:PRINT USING "$$###.##"
;VAL(A$);:PRINT S20$:GOSUB 1040:CCVE(C,I)=VAL(A$):ELSE LOCATE X,57:PRINT;S20$
840 X=X+1
850 NEXT I
860 GOTO 790
870 CLS:PRINT:PRINT TAB(25);"CROP BUDGET : SOYBEANS":PRINT:PRINT TAB(10);"CASH V
ARIABLE EXPENSES PER ACRE FOR A YIELD OF ";SYLD;" BUSHELS":PRINT
880 FOR I=1 TO 12
890 SCVE(S,I)=SCVE(S,I)*CUMINFLA(CYCLE)
900 PRINT TAB(15);CVE$(I);TAB(45);:PRINT USING "$$###.##";SCVE(S,I)
910 SUMSCVE=SUMSCVE+SCVE(S,I)
920 NEXT I
930 PRINT TAB(44);DASH$;DASH$:PRINT:PRINT TAB(15);"TOTAL . . .";TAB(43);:PRINT U
SING "$$#,###.##";SUMSCVE
940 LOCATE 23,1:PRINT S79$;:LOCATE 23,15,1:PRINT"DO YOU WANT TO ENTER IN YOUR OW
N VALUES ?";
945 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN GOTO 945
950 D=INSTR(DEE$,D$):IF D < 4 THEN 1060:ELSE LOCATE 23,1:PRINT S79$;:GOTO 980
960 LOCATE 23,1:PRINT S79$;:LOCATE 23,24:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?
";
965 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN GOTO 965
```

```
970 D=INSTR(DEE$,D$):IF D < 4 THEN 1060:ELSE LOCATE 23,1:PRINT S79$;:GOTO 980
980 X=CSRLIN-17
990 FOR I=1 TO 12
1000 LOCATE X,57:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,45:PRINT USING "$$###.##
";VAL(A$);:PRINT S20$:GOSUB 1050:SCVE(S,I)=VAL(A$):ELSE LOCATE X,57:PRINT;S20$
1010 X=X+1
1020 NEXT I
1030 GOTO 960
1040 SUMCCVE=SUMCCVE+VAL(A$)-CCVE(C,I):LOCATE 20,43:PRINT USING "$$#,###.##";SUM
CCVE;:PRINT S10$:RETURN
1050 SUMSCVE=SUMSCVE+VAL(A$)-SCVE(S,I):LOCATE 20,43:PRINT USING "$$#,###.##";SUM
SCVE;:PRINT S10$;:RETURN
1060 SUMCCVE=0:SUMSCVE=0:FOR I=1 TO 12
1070 IF I>2 AND I<6 THEN CCVE(C,I)=CCVE(C,I)*(1-DISFAC(I,ACRES)):SCVE(S,I)=SCVE(
S,I)*(1-DISFAC(I,ACRES))
1080 SUMCCVE=SUMCCVE+CCVE(C,I):SUMSCVE=SUMSCVE+SCVE(S,I)
1090 NEXT I
1100 RETURN
1110 REM CASH FIXED EXPENSES SUBROUTINE
1120 REM CLS:SUMCFE=0:FOR I= 2 TO 5:CFE(I)=0:NEXT I:CFE(1)=PPDLEASE:REM ZERO OUT
 PREVIOUS CASH FIXED EXPENSES AND CAPTURING RENT FROM MOD2
1125 CLS:SUMCFE=0:CFE(1)=PPDLEASE:REM ZERO OUT PREVIOUS CASH FIXED EXPENSES AND
CAPTURING RENT FROM MOD2
1130 PRINT
1140 PRINT TAB(23);"TOTAL CASH FIXED EXPENSES  : ";YEAR:PRINT
1150 PRINT:PRINT TAB(18);" ( PLEASE ENTER TOTALS FOR CORN & SOYBEANS )":PRINT:PR
INT
1160 FOR I=1 TO 5
1170 PRINT TAB(20);CFE$(I);TAB(46);:PRINT USING "$$##,###.##";CFE(I):PRINT
1180 SUMCFE=SUMCFE+CFE(I)
1190 NEXT I
1200 PRINT TAB(48);DASH$;DASH$:PRINT:PRINT TAB(20);"TOTAL ...";TAB(45):PRINT USI
NG "$$###,###.##";SUMCFE
1210 GOTO 1260:X=CSRLIN-11
1220 FOR I=1 TO 5
1230 LOCATE X,60:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "$$##,###
.##";VAL(A$);:PRINT S1$;:PRINT S20$:GOSUB 1290:CFE(I)=VAL(A$):ELSE LOCATE X,60:P
RINT S20$
1240 X=X+2
1250 NEXT I
1260 LOCATE 23,1:PRINT S79$:LOCATE 23,22:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?
";
1265 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1265
1270 D=INSTR(DEE$,D$):IF D<4 THEN GOTO 1280:ELSE LOCATE 23,1:PRINT S79$;:X=CSRLI
N-15:GOTO 1220
1280 RETURN
1290 SUMCFE=SUMCFE+VAL(A$)-CFE(I):LOCATE 20,45:PRINT USING "$$###,###.##";SUMCFE
;:PRINT S10$:RETURN
1300 REM COMMODITY PRICE SUBROUTINE
1310 CLS:WIDTH 40
1320 PRINT TAB(6);"COMMODITY PRICE INFORMATION":PRINT:PRINT TAB(13);"*** CORN **
*"
1330 PRINT:PRINT "YOU MAY ADJUST CORN PRICES BY ";CHR$(241);:PRINT USING "$$#.##
";TOLC-.01
1340 PRINT:PRINT:PRINT TAB(1);"YEAR";TAB(6);"PRICE";TAB(22);"YEAR";TAB(27);"PRIC
E":PRINT
1350 X=10:Y=10:FOR I=1 TO 10:TCRNPR(I)=CRNPR(I):NEXT I
1360 FOR I=1 TO 10
1370 IF I > CYCLES THEN COLOR 7,0: ELSE COLOR 0,7
1380 IF I<6 THEN LOCATE X,1:PRINT CRNPRYR$(I);TAB(5);:PRINT USING "$$#.##";CRNPR
```

```
(I)
1390 IF I>=6 THEN LOCATE Y,22:PRINT CRNPRYR$(I);TAB(26);:PRINT USING "$$#.##";CR
NPR(I)
1400 IF I > 5 THEN Y=Y+2: ELSE X=X+2
1410 NEXT I
1420 COLOR 7,0
1430 LOCATE 22,1:PRINT S39$;:LOCATE 22,3:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?
";
1440 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1440
1445 D=INSTR(DEE$,D$):IF D<4 THEN GOTO 1560 : ELSE LOCATE 22,1:PRINT S39$;
1450 X=CSRLIN-12
1460 Y=CSRLIN-12
1470 FOR I=1 TO CYCLES
1480 IF I<6 THEN LOCATE X,12:PRINT S7$;:LOCATE X,12:INPUT"=> ",A$:IF A$="" THEN
LOCATE X,12 : PRINT S7$;
1490 IF (I<6) AND (A$ <> "")  THEN IF VAL(A$)<TCRNPR(I)-TOLC OR VAL(A$)>TCRNPR(I
)+TOLC THEN GOSUB 1550:GOTO 1480:ELSE LOCATE X,5:COLOR 0,7:PRINT USING "$$#.##";
VAL(A$);:COLOR 7,0:PRINT S10$;:CRNPR(I) = VAL(A$):LOCATE 22,1:PRINT S39$;
1500 IF I>5 THEN LOCATE Y,33:PRINT S7$:LOCATE Y,33:INPUT"=> ",A$:IF A$="" THEN L
OCATE Y,33:PRINT S7$;
1510 IF I>5 AND A$<>"" THEN IF VAL(A$)<TCRNPR(I)-TOLC OR VAL(A$)>TCRNPR(I)+TOLC
THEN GOSUB 1550:GOTO 1500:ELSE LOCATE Y,26:COLOR 0,7:PRINT USING "$$#.##";VAL(A$
);:COLOR 7,0:LOCATE Y,33:PRINT S7$;:CRNPR(I)=VAL(A$):LOCATE 22,1:PRINT S39$;
1520 IF I>5 THEN Y=Y+2 : ELSE X=X+2
1530 NEXT I
1540 GOTO 1430
1550 LOCATE 22,1:PRINT "ENTER VALUES WITHIN THE TOLERANCE LIMIT";:RETURN
1560 CLS:WIDTH 40
1570 PRINT TAB(6);"COMMODITY PRICE INFORMATION":PRINT:PRINT TAB(12);"*** SOYBEAN
 ***"
1580 PRINT:PRINT"YOU MAY ADJUST SOYBEAN PRICES BY ";CHR$(241);:PRINT USING"$$#.#
#";TOLS-.01
1590 PRINT:PRINT TAB(1);"YEAR";TAB(6);"PRICE";TAB(22);"YEAR";TAB(27);"PRICE":PRI
NT
1600 X=10:Y=10:FOR I= 1 TO 10:TSYBPR(I)=SYBPR(I):NEXT I
1610 FOR I=1 TO 10
1620 IF I > CYCLES THEN COLOR 7,0: ELSE COLOR 0,7
1630 IF I<6 THEN LOCATE X,1:PRINT SYBPRYR$(I);TAB(5);:PRINT USING "$$#.##";SYBPR
(I)
1640 IF I>=6 THEN LOCATE Y,22:PRINT SYBPRYR$(I);TAB(27);:PRINT USING "$$#.##";SY
BPR(I)
1650 IF I > 5 THEN Y=Y+2: ELSE X=X+2
1660 NEXT I
1670 COLOR 7,0
1680 LOCATE 22,1:PRINT S39$;:LOCATE 22,3:PRINT"DO YOU WANT TO MAKE ANY CHANGES ?
";
1685 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1685
1690 D=INSTR(DEE$,D$):IF D<4 THEN GOTO 1800 : ELSE LOCATE 22,1:PRINT S39$;
1700 X=CSRLIN-12
1710 Y=CSRLIN-12
1720 FOR I=1 TO CYCLES
1730 IF I<6 THEN LOCATE X,12:PRINT S7$;:LOCATE X,12:INPUT"=> ",A$:IF A$="" THEN
LOCATE X,12 : PRINT S7$;
1740 IF (I<6) AND (A$ <> "")  THEN IF VAL(A$)<TSYBPR(I)-TOLS OR VAL(A$)>TSYBPR(I
)+TOLS THEN GOSUB 1550:GOTO 1480:ELSE LOCATE X,5:COLOR 0,7:PRINT USING "$$#.##";
VAL(A$);:COLOR 7,0:PRINT S10$;:SYBPR(I) = VAL(A$):LOCATE 22,1:PRINT S39$;
1750 IF I>5 THEN LOCATE Y,33:PRINT S7$:LOCATE Y,33:INPUT"=> ",A$:IF A$="" THEN L
OCATE Y,33:PRINT S7$;
1760 IF I>5 AND A$<>"" THEN IF VAL(A$)<SYBPR-TOLS OR VAL(A$)>SYBPR+TOLS THEN GOS
UB 1550:GOTO 1500:ELSE LOCATE Y,26:COLOR 0,7:PRINT USING "$$#.##";VAL(A$);:COLOR
```

```
 7,0:LOCATE Y,33:PRINT S7$;:SYBPR(I)=VAL(A$):LOCATE 22,1:PRINT S39$;
1770 IF I>5 THEN Y=Y+2 : ELSE X=X+2
1780 NEXT I
1790 GOTO 1680
1800 EPC=CRNPR(CYCLE)*(.9014)+(.001)*CYCLE
1810 EPS=SYBPR(CYCLE)*(.9795999)+(.001)*CYCLE
1820 RETURN
1830 REM INSURANCE SUBROUTINE
1840 CLS:WIDTH 80
1850 PRINT:PRINT:PRINT TAB(25);"ALL - RISK CROP INSURANCE OPTION":PRINT:PRINT
1860 PRINT:PRINT "THIS PROGRAM ENABLES THE USER TO SELECT FROM A COMBINATION OF
THREE QUARANTEED"
1870 PRINT:PRINT "YIELD LEVELS ALONG WITH THREE LEVELS OF INSURED CROP PRICES (I
NDEMNITY PRICES)."
1880 PRINT:PRINT "IF YOU ELECT TO PURCHASE INSURANCE , 100 PERCENT OF EACH CROP
MUST BE INSURED ."
1890 PRINT:PRINT:PRINT "CASHFLOW EXPOSURE FIGURES ARE BASED ON A YIELD WHICH JUS
T TRIGGERS AN INSURANCE"
1900 PRINT:PRINT "CLAIM.  CASHFLOW EXPOSURE WILL WORSEN AS THE  REALIZED  YIELD
 DECLINES  AND AN"
1910 PRINT:PRINT "INDEMNITY PRICE LESS THAN 100 PERCENT IS SELECTED."
1920 LOCATE 22,1:PRINT S79$;:LOCATE 22,30:PRINT"PRESS < C > TO CONTINUE ";
1921 D$=INKEY$:IF D$="c" OR D$="C" THEN 1930:ELSE 1921
1930 CLS
1940 IF CYCLE > 1 THEN RETURN
1950 PRINT:PRINT TAB(25);"ALL - RISK CROP INSURANCE OPTION":PRINT
1960 PRINT:PRINT "TO GENERATE INSURANCE  PREMIUM  RATES AND POTENTIAL NET BENEFI
TS FROM ENROLLING"
1970 PRINT:PRINT "IN THE ALL-RISK INSURANCE PROGRAM PLEASE SUPPLY THE FOLLOWING
YIELD INFORMATION."
1980 PRINT:PRINT TAB(15);"5 YEAR CORN YIELDS";TAB(45);"5 YEAR SOYBEAN YIELDS"
1990 X=11
2000 FOR I=1 TO 5
2010 LOCATE X+I,14:PRINT PYEAR+I;TAB(21);:PRINT USING "###";PCY(I);:PRINT TAB(26
);"BU/ACRE"
2020 LOCATE X+I,44:PRINT PYEAR+I;TAB(51);:PRINT USING "###";PSY(I);:PRINT TAB(56
);"BU/ACRE"
2030 X=X+1:NEXT I:GOTO 2080
2040 LOCATE ,,1,0,7:X=11:FOR I=1 TO 5
2050 LOCATE X+I,34:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X+I,21:PRINT USING "###"
;VAL(A$);:PRINT TAB(26);"BU/ACRE";S10$;:PCY(I)=VAL(A$):ELSE LOCATE X+I,34:PRINT
S10$;
2060 LOCATE X+I,64:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X+I,51:PRINT USING "###"
;VAL(A$);:PRINT TAB(56);"BU/ACRE";S10$:PSY(I)=VAL(A$):ELSE LOCATE X+I,64:PRINT S
10$
2070 X=X+1:NEXT I
2080 LOCATE 24,1:PRINT S79$;:LOCATE 23,24:PRINT"DO YOU WANT TO MAKE ANY CHANGES
";
2082 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 2082
2084 D=INSTR(DEE$,D$):IF D < 4 THEN RETURN:ELSE LOCATE 23,1:PRINT S79$;:GOTO 204
0
2090 REM INSURACE SUBROUTINE CALCULATIONS
2100 REM CALCULATE TMCC AND TMCS
2110 CLS:LOCATE 12,30:PRINT"One moment please ...":BEEP
2120 SUMPCY=0:SUMPSY=0:TMCC=0:TMCS=0:HIGHC=0:LOWC=1000:HIGHS=0:LOWS=1000
2130 FOR I=1 TO 5
2140 IF PCY(I)>HIGHC THEN HIGHC=PCY(I)
2150 IF PCY(I)<LOWC THEN LOWC=PCY(I)
2160 IF PSY(I)<LOWS THEN LOWS=PSY(I)
2170 IF PSY(I)>HIGHS THEN HIGHS=PSY(I)
```

```
2180 SUMPSY=SUMPSY+PSY(I)
2190 SUMPCY=SUMPCY+PCY(I)
2200 NEXT I
2210 SUMPCY=SUMPCY-(HIGHC+LOWC)
2220 SUMPSY=SUMPSY-(HIGHS+LOWS)
2230 TMCC=SUMPCY/3:SDC=.25*TMCC
2240 TMCS=SUMPSY/3:SDS=.25*TMCS
2250 TYLDC=TMCC+(2*(1.6735))+CYCLE*1.6735
2260 YLDC=TYLDC*1.15*(1-LN^(-8.25*GAMMA1S))
2270 TYLDS=TMCS+(2*(.4115))+CYCLE*.4115
2280 YLDS=TYLDS*1.15*(1-LN^(-8.25*GAMMA1S))
2290 FOR I=1 TO 3
2300 IPC(I)=EPC*IPPC(I)
2310 IPS(I)=EPS*IPPS(I)
2320 NEXT I
2330 FOR I=1 TO 3
2340 GYC(I)=TMCC*YG(I)
2350 GYS(I)=TMCS*YG(I)
2360 UBC=TMCC+2.4*SDC
2370 UBS=TMCS+2.4*SDS
2380 LBC=TMCC-2.4*SDC
2390 LBS=TMCS-2.4*SDS
2400 PROBC(I)=(GYC(I)-LBC)^2/((TMCC-LBC)*(UBC-LBC))
2410 PROBS(I)=(GYS(I)-LBS)^2/((TMCS-LBS)*(UBS-LBS))
2420 XBARC=.3333*(GYC(I)-LBC)
2430 XBARS=.3333*(GYS(I)-LBS)
2440 FOR J=1 TO 3
2450 XBARCPMT(I,J)=PROBC(I)*XBARC*(EPC*IPC(J))
2460 XBARSPMT(I,J)=PROBS(I)*XBARS*(EPS*IPS(J))
2465 REM INSURANCE PREMIUM EQUATIONS UPDATED ON 10/15/88 TO MORE CLOSELY REFLECT
THE AVERAGE PREMIUMS PAID IN 1987 ACCORDING TO GAO REPORT-RCED-88-171BR, JULY 19
88
2470 REM PREMC(I,J)=XBARCPMT(I,J)*1.2
2472 IF I=1 THEN PREMC(I,J)=XBARCPMT(I,J)*15:PREMS(I,J)=XBARSPMT(I,J)*3:GOTO 249
0
2474 IF I=2 THEN PREMC(I,J)=XBARCPMT(I,J)*1.2:PREMS(I,J)=XBARSPMT(I,J)*.33:GOTO
2490
2476 IF I=3 THEN PREMC(I,J)=XBARCPMT(I,J)*.9:PREMS(I,J)=XBARSPMT(I,J)*.2:GOTO 24
90
2480 REM PREMS(I,J)=XBARSPMT(I,J)*1.2
2490 OPIN.C=(SUMCCVE+PREMC(I,J)+((SUMCFE*(CAP/100))/TOTACRN))*(IN.C*.5)
2500 OPIN.S=(SUMSCVE+PREMS(I,J)+((SUMCFE*(SAP/100))/TOTASYB))*(IN.C*.5)
2510 CFXPC(I,J)=((EPC*(GYC(I)-1))+IPC(J)*1-SUMCCVE-PREMC(I,J))*TOTACRN-(SUMCFE*C
AP/100)-(DBT.I*IN.I*CAP/100)-(DBT.L*IN.L*CAP/100)-(DBT.C*IN.C*CAP/100)-OPIN.C*TO
TACRN
2520 CFXPS(I,J)=((EPS*(GYS(I)-1))+IPS(J)*1-SUMSCVE-PREMS(I,J))*TOTASYB-(SUMCFE*S
AP/100)-(DBT.I*IN.I*SAP/100)-(DBT.L*IN.L*SAP/100)-(DBT.C*IN.C*SAP/100)-OPIN.S*TO
TASYB
2530 NEXT J
2540 NEXT I
2545 REM THE .45 AND .65 ADJUSTMENT IN 2550 &2560 REFLECTS THAT % OF TOTAL VARIA
BLE COSTS SPENT AT PLANTING
2550 NOINSRC=-(SUMCCVE*TOTACRN*.45)-(SUMCFE*CAP/100)-(DBT.I*IN.I*CAP/100)-(DBT.L
*IN.L*CAP/100)-(DBT.C*IN.C*CAP/100)-OPIN.C*TOTACRN
2560 NOINSRS=-(SUMSCVE*TOTASYB*.65)-(SUMCFE*SAP/100)-(DBT.I*IN.I*SAP/100)-(DBT.L
*IN.L*SAP/100)-(DBT.C*IN.C*SAP/100)-OPIN.S*TOTASYB
2570 REM COMPUTE BREAK-EVEN YIELD TO CONSIDER HARVESTING
2580 BEHYCN1=(((CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+CCVE(C,8)+CCVE(C,11)+CCVE(C,12))*.
75)+CCVE(C,9)*.5+CCVE(C,6)+CCVE(C,10))
2590 BEHYCN2=((CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+CCVE(C,8)+CCVE(C,11)+CCVE(C,12))*.7
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```
5+CCVE(C,9)*.5+CCVE(C,10)+CCVE(C,6))*(IN.C*.5)
2600 BEHYCD1=((CCVE(C,3)+CCVE(C,4)+CCVE(C,5))+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+CCV
E(C,8)+CCVE(C,11)+CCVE(C,12))*.25)
2610 BEHYCD2=CCVE(C,9)*.5+PREMC(3,3)+((CCVE(C,3)+CCVE(C,4)+CCVE(C,5)+PREMC(3,3))
+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+CCVE(C,8)+CCVE(C,11)+CCVE(C,12))*.25+CCVE(C,9)*.
5)*IN.C*.5
2620 BEHYC=(BEHYCN1+BEHYCN2)/EPC:REM (BEHYCD1+BEHYCD2)/YLDC)
2630 BEHYSN1=(((SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+SCVE(S,8)+SCVE(S,11)+SCVE(S,12))*.
75)+SCVE(S,9)*.5+SCVE(S,10)+SCVE(S,6))
2640 BEHYSN2=((SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+SCVE(S,8)+SCVE(S,11)+SCVE(S,12))*.7
5+SCVE(S,9)*.5+SCVE(S,10)+SCVE(S,6))*(IN.C*.5)
2650 BEHYSD1=((SCVE(S,3)+SCVE(S,4)+SCVE(S,5))+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+SCV
E(S,8)+SCVE(S,11)+SCVE(S,12))*.25)
2660 BEHYSD2=SCVE(S,9)*.5+PREMS(3,3)+((SCVE(S,3)+SCVE(S,4)+SCVE(S,5)+PREMS(3,3))
+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+SCVE(S,8)+SCVE(S,11)+SCVE(S,12))*.25+SCVE(S,9)*.
5)*IN.C*.5
2670 BEHYS=(BEHYSN1+BEHYSN2)/EPS:REM-(BEHYSD1+BEHYSD2)/YLDS)
2680 FOR I= 1 TO 3
2690 IF GYC(I)<BEHYC THEN FOR J=1 TO 3:CFXPC(I,J)=((IPC(J)*GYC(I))-(BEHYCD1+BEHY
CD2)-PREMC(I,J))*TOTACRN-(SUMCFE*CAP/100)-(DBT.I*IN.I*(CAP/100))-(DBT.L*IN.L*(CA
P/100)):NEXT J
2700 IF GYS(I)<BEHYS THEN FOR J=1 TO 3:CFXPS(I,J)=((IPS(J)*GYS(I))-(BEHYSD1+BEHY
SD2)-PREMS(I,J))*TOTASYB-(SUMCFE*SAP/100)-(DBT.I*IN.I*(SAP/100))-(DBT.L*IN.L*(SA
P/100)):NEXT J
2710 NEXT I
2720 RETURN
2730 CLS: REM ALL-RISK CROP INSURANCE TABLE SUBROUTINE
2740 PRINT TAB(25);"ALL-RISK INSURANCE TABLE  : CORN":PRINT
2750 PRINT TAB(8);"BREAK EVEN YIELD TO CONSIDER HARVEST WITH MAX INSUR. COV.";IN
T(BEHYC);"BU"
2760 PRINT:NUM=0:D$=""
2770 FOR I=1 TO 80:PRINT "-";:NEXT I
2780 PRINT"SELECTION";SPC(2);"GAR.YLD:INDMN.PR";SPC(3);"PREMIUM COST";SPC(3);"OD
DS OF PAYOFF";SPC(3);"CASHFL EXPOSURE"
2790 FOR I=1 TO 80:PRINT "-";:NEXT I
2800 FOR I=1 TO 3
2810 FOR J=1 TO 3
2820 NUM=NUM+1
2830 PRINT TAB(5);NUM;TAB(12);INT(GYC(I));"BU :";:PRINT USING"$$#.##";IPC(J):LOC
ATE CSRLIN-1,29:PRINT USING"$$###.##/ACRE";PREMC(I,J):LOCATE CSRLIN-1,49:PRINT "
1  IN ";INT(1/PROBC(I));TAB(65);:PRINT USING"$$####,###";CFXPC(I,J)
2840 NEXT J
2850 PRINT
2860 NEXT I
2870 PRINT TAB(4);NUM+1;TAB(13);"No Insurance : Cashfl Exposure 100 %  Crop Fail
ure";TAB(65);:PRINT USING "$$####,###";NOINSRC
2880 LOCATE 23,1:PRINT S79$;:LOCATE 23,17:INPUT"ENTER YOUR INSURANCE SELECTION N
UMBER ( 1-10 ) ";SELC:IF SELC< 1 OR SELC> 10 THEN 2880
2890 IF SELC< 4 THEN I=1 :ELSE IF SELC> 6 THEN I=3 :ELSE I=2
2900 IF SELC MOD 3 = 0 THEN J=3:ELSE IF SELC MOD 3 = 1 THEN J=1:ELSE J=2
2910 IF SELC=10 THEN CFXPC=NOINSRC:ELSE GYC=GYC(I):IPC=IPC(J):PREMC=PREMC(I,J):P
ROBC=PROBC(I):CFXPC=CFXPC(I,J)
2920 X=CSRLIN-17
2930 IF SELC < 4 THEN X=X+SELC :ELSE IF SELC < 7 THEN X=X+SELC+1 : ELSE IF SELC
< 10 THEN X=X+SELC+2:ELSE X=X+SELC+3
2940 LOCATE X,1:COLOR 0,7
2950 PRINT S79$;:LOCATE X,1:IF SELC=10 THEN PRINT TAB(4);SELC;TAB(13);"No Insura
nce : Cashfl Exposure 100 % Crop Failure";TAB(65);:PRINT USING "$$####,###";NOIN
SRC
2960 IF SELC <> 10 THEN PRINT TAB(5);SELC;TAB(12);INT(GYC(I));"BU :";:PRINT USIN
```

```
G"$$#.##";IPC(J):LOCATE CSRLIN-1,29:PRINT USING"$$###.##/ACRE";PREMC(I,J):LOCATE
 CSRLIN-1,49:PRINT "1  IN ";INT(1/PROBC(I));TAB(65);:PRINT USING"$$####,###";CFX
PC(I,J)
2970 COLOR 7,0 :IF D$="Y" OR D$="y" THEN D$="":GOTO 2880
2980 LOCATE 23,1:PRINT S79$;:LOCATE 23,25:PRINT"DO YOU WANT TO MAKE ANY CHANGES
";
2981 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 2981
2982 D=INSTR(DEE$,D$):IF D > 3 THEN LOCATE X,1:GOTO 2950
2990 CLS:D$=""
3000 PRINT TAB(22);"ALL-RISK INSURANCE TABLE  : SOYBEANS":PRINT
3010 PRINT TAB(8);"BREAK EVEN YIELD TO CONSIDER HARVEST WITH MAX INSUR. COV.";IN
T(BEHYS);"BU"
3020 PRINT:NUM=0
3030 FOR I=1 TO 80:PRINT "-";:NEXT I
3040 PRINT"SELECTION";SPC(2);"GAR.YLD:INDMN.PR";SPC(3);"PREMIUM COST";SPC(3);"OD
DS OF PAYOFF";SPC(3);"CASHFL EXPOSURE"
3050 FOR I=1 TO 80:PRINT "-";:NEXT I
3060 FOR I=1 TO 3
3070 FOR J=1 TO 3
3080 NUM=NUM+1
3090 PRINT TAB(5);NUM;TAB(12);INT(GYS(I));"BU :";:PRINT USING"$$#.##";IPS(J):LOC
ATE CSRLIN-1,29:PRINT USING"$$###.##/ACRE";PREMS(I,J):LOCATE CSRLIN-1,49:PRINT "
1  IN ";INT(1/PROBS(I));TAB(65);:PRINT USING"$$####,###";CFXPS(I,J)
3100 NEXT J
3110 PRINT
3120 NEXT I
3130 PRINT TAB(4);NUM+1;TAB(13);"No Insurance : Cashfl Exposure 100 % Crop Failu
re";TAB(65);:PRINT USING "$$####,###";NOINSRS
3140 LOCATE 23,1:PRINT S79$;:LOCATE 23,17:INPUT"ENTER YOUR INSURANCE SELECTION N
UMBER ( 1-10 ) ";SELS:IF SELS < 1 OR SELS > 10 THEN 2880
3150 IF SELS< 4 THEN I=1 :ELSE IF SELS> 6 THEN I=3 :ELSE I=2
3160 IF SELS MOD 3 = 0 THEN J=3:ELSE IF SELS MOD 3 = 1 THEN J=1:ELSE J=2
3170 IF SELS=10 THEN CFXPS=NOINSRS:ELSE GYS=GYS(I):IPS=IPS(J):PREMS=PREMS(I,J):P
ROBS=PROBS(I):CFXPS=CFXPS(I,J)
3180 X=CSRLIN-17
3190 IF SELS < 4 THEN X=X+SELS :ELSE IF SELS< 7 THEN X=X+SELS+1 : ELSE IF SELS<
10 THEN X=X+SELS+2:ELSE X=X+SELS+3
3200 LOCATE X,1:COLOR 0,7
3210 PRINT S79$;:LOCATE X,1:IF SELS=10 THEN PRINT TAB(4);SELS;TAB(13);"No Insura
nce : Cashfl Exposure 100 % Crop Failure";TAB(65);:PRINT USING "$$####,###";NOIN
SRS
3220 IF SELS<> 10 THEN PRINT TAB(5);SELS;TAB(12);INT(GYS(I));"BU :";:PRINT USING
"$$#.##";IPS(J):LOCATE CSRLIN-1,29:PRINT USING"$$###.##/ACRE";PREMS(I,J):LOCATE
CSRLIN-1,49:PRINT "1  IN ";INT(1/PROBS(I));TAB(65);:PRINT USING"$$####,###";CFXP
S(I,J)
3230 COLOR 7,0 :IF D$="Y" OR D$="y" THEN D$="":GOTO 3140
3240 LOCATE 23,1:PRINT S79$;:LOCATE 23,25:PRINT"DO YOU WANT TO MAKE ANY CHANGES
";
3241 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 3241
3242 D=INSTR(DEE$,D$):IF D < 4 THEN RETURN:ELSE LOCATE X,1:GOTO 3210
3250 REM CROP MIX SUBROUTINE
3260 PREMCNET=PREMC*.2
3270 PREMSNET=PREMS*.2
3280 EGRPAC=EPC*YLDC
3290 EGRPAS=EPS*YLDS
3300 TOTACRN=TOTA*CAP/100:TOTASYB=TOTA*SAP/100
3310 OPIN.C=(SUMCCVE + PREMC + ((SUMCFE*(CAP/100))/TOTACRN))*(IN.C*.5)
3320 OPIN.S=(SUMSCVE + PREMS + ((SUMCFE*(SAP/100))/TOTASYB))*(IN.C*.5)
3330 EGMPAC=EGRPAC-SUMCCVE-PREMC-((DBT.C*IN.C*CAP/100)/TOTACRN)-OPIN.C
3340 EGMPAS=EGRPAS-SUMSCVE-PREMS-((DBT.C*IN.C*SAP/100)/TOTASYB)-OPIN.S
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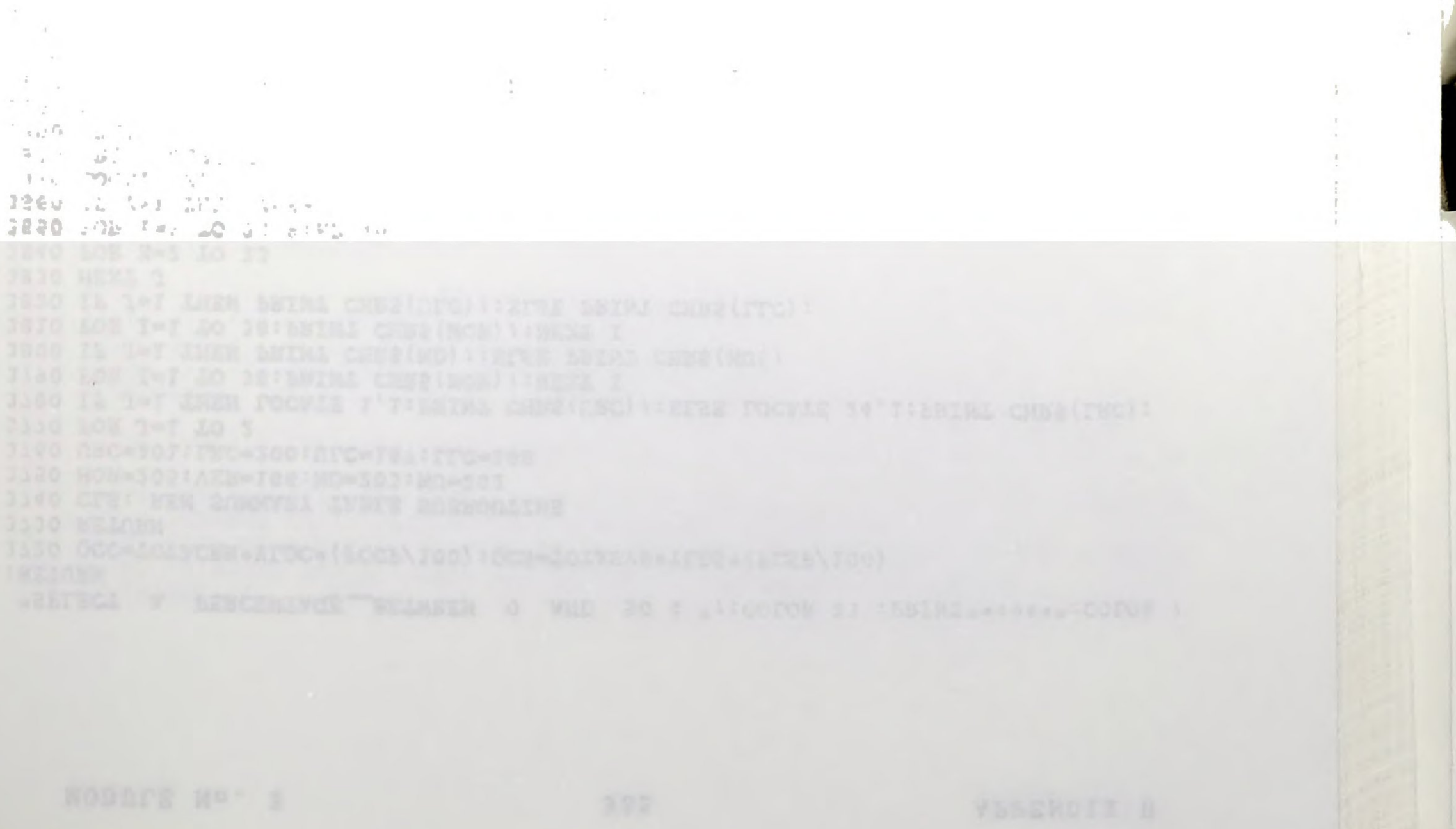
```
3350 CLS:WIDTH 40
3360 COLOR 15:PRINT TAB(8);"CROP MIX SELECTION ";YEAR:PRINT:COLOR 7
3370 PRINT"(THE CROP MIX BY DEFAULT IS 50:50. YOU":PRINT:PRINT " HAVE A ";CHR$(2
41);" 10 % ACREAGE SHIFT OPTION .)":PRINT:PRINT
3380 PRINT TAB(4);"EXP. GR. MARG. ACRE/CORN :";:PRINT USING "$$###.##";EGMPAC:PR
INT
3390 PRINT TAB(4);"EXP. GR. MARG. ACRE/SOY  :";:PRINT USING "$$###.##";EGMPAS:PR
INT
3400 PRINT:PRINT TAB(8);"CORN      : ";TOTACRN;" ACRES":PRINT
3410 PRINT TAB(8);"SOYBEANS : ";TOTASYB;" ACRES":PRINT:PRINT
3420 PRINT TAB(8);"CORN (40% - 60%) :";CAP;"%":PRINT
3430 PRINT TAB(8);"SOYBEANS         :";SAP;"%"
3440 LOCATE 23,1:PRINT S39$;:LOCATE 23,2:PRINT"DO YOU WANT TO CHANGE THE CROP MI
X ?";
3441 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 3441
3442 D=INSTR(DEE$,D$):IF D < 4 THEN RETURN:ELSE LOCATE 23,1:PRINT S39$;:X=CSRLIN
-5
3450 LOCATE X,31:PRINT S10$;:LOCATE X,31:INPUT" => ",A$:IF VAL(A$)<40 OR VAL(A$)
>60 THEN GOTO 3450:ELSE IF A$<>"" THEN CAP=VAL(A$):LOCATE X,26:PRINT CAP;"%";S7$
:ELSE LOCATE X,31:PRINT S10$
3460 SAP=100-CAP
3470 X=X+2
3480 LOCATE X,26:PRINT SAP;"%"
3490 TOTACRN=TOTA*CAP/100:TOTASYB=TOTA*SAP/100
3500 LOCATE 8,1:GOTO 3380
3510 CLS:WIDTH 80: REM COMMODITY MARKETING SUBROUTINE
3520 COLOR 15
3530 PRINT TAB(20);"COMMODITY MARKETING STRATEGIES FOR  : ";YEAR
3540 COLOR 7
3550 PRINT:PRINT:PRINT TAB(10);"NOTE  :   FORWARD CONTRACTING OF EACH COMMODITY
IS POSSIBLE"
3560 PRINT:PRINT TAB(10);"SELECTING BETWEEN  0  AND  50 %  OF THE EXPECTED CROP
YIELD."
3570 PRINT:PRINT TAB(10);"BY DEFAULT, EACH CROP WILL BE ASSUMED TO BE SOLD ENTIR
ELY AT"
3580 PRINT:PRINT TAB(10);"HARVEST .  HARVEST PRICE IS BASED ON NOVEMBER PRICE FO
R CORN"
3590 PRINT:PRINT TAB(10);"AND OCTOBER PRICE FOR SOYBEANS."
3600 PRINT:PRINT:PRINT TAB(10);"NOTE  :  THE FORWARD CONTRACTING PRICE FOR CORN
IS  : ";:PRINT USING "$$#.##";EPC
3610 PRINT:PRINT TAB(10);"                                    FOR SOYBEANS IS  :
";:PRINT USING "$$#.##";EPS
3620 PRINT:PRINT TAB(10);"SELECT THE DESIRED CONTRACT PERCENTAGE FOR CORN    :
 ";FCCP;"%"
3630 PRINT:PRINT TAB(10);"SELECT THE DESIRED CONTRACT PERCENTAGE FOR SOYBEANS :
 ";FSCP;"%"
3640 GOTO 3700
3650 LOCATE X,71:INPUT " => ",A$:IF A$<>"" THEN FCCP=VAL(A$):LOCATE X,65:PRINT F
CCP;"% ";S10$;:ELSE LOCATE X,71:PRINT S10$;
3660 IF FCCP>50 THEN GOSUB 3710:GOTO 3650
3670 LOCATE 23,1:PRINT S79$;:X=X+2
3680 LOCATE X,71:INPUT " => ",A$:IF A$<>"" THEN FCSP=VAL(A$):LOCATE X,65:PRINT F
CSP;"% ";S10$:ELSE LOCATE X,71:PRINT S10$;
3690 IF FCSP>50 THEN GOSUB 3710:GOTO 3680
3700 LOCATE 23,1:PRINT S79$;:LOCATE 23,25:PRINT"DO YOU WANT TO MAKE ANY CHANGES
?";
3701 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 3701
3702 D=INSTR(DEE$,D$):IF D < 4 THEN GOTO 3720:ELSE LOCATE 23,1:PRINT S79$;:X=CSR
LIN-4:GOTO 3650
3710 LOCATE 23,1:PRINT S79$;:LOCATE 23,14:COLOR 23:PRINT "***** ";:COLOR 7:PRINT
```

```
 "SELECT  A  PERCENTAGE  BETWEEN  0  AND  50 % ";:COLOR 23 :PRINT"*****":COLOR 7
:RETURN
3720 QCC=TOTACRN*YLDC*(FCCP/100):QCS=TOTASYB*YLDS*(FCSP/100)
3730 RETURN
3740 CLS: REM SUMMARY TABLE SUBROUTINE
3750 HOR=205:VER=186:MD=203:MU=202
3760 URC=201:LRC=200:ULC=187:LLC=188
3770 FOR J=1 TO 2
3780 IF J=1 THEN LOCATE 1,1:PRINT CHR$(URC);:ELSE LOCATE 24,1:PRINT CHR$(LRC);
3790 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
3800 IF J=1 THEN PRINT CHR$(MD);:ELSE PRINT CHR$(MU);
3810 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
3820 IF J=1 THEN PRINT CHR$(ULC);:ELSE PRINT CHR$(LLC);
3830 NEXT J
3840 FOR X=2 TO 23
3850 FOR Y=1 TO 80 STEP 40
3860 IF Y>1 THEN Y=Y-1
3870 LOCATE X,Y
3880 PRINT CHR$(VER);
3890 NEXT Y
3900 NEXT X
3910 IF SELC=10 AND SELS =10 THEN X=3:ELSE X=2
3920 LOCATE X,18:PRINT "CORN":LOCATE X,55:PRINT "SOYBEANS"
3930 IF SELC=10 AND SELS= 10 THEN X=X+3:ELSE X=X+2
3940 LOCATE X,4:PRINT TOTACRN;" ACRES";S5$;"(";CAP;"% TOTAL )":LOCATE X,42:PRINT
 TOTASYB;" ACRES";S5$;"(";SAP;"% TOTAL )"
3950 X=X+2
3960 LOCATE X,5:PRINT USING "EXPECTED PRICE  :  $$#.##";EPC:LOCATE X,43:PRINT US
ING "EXPECTED PRICE :  $$#.##";EPS
3970 X=X+2
3980 LOCATE X,5:PRINT USING "EXPECTED YIELD  :   ### BU";YLDC:LOCATE X,43:PRINT
USING "EXPECTED YIELD :    ## BU";YLDS
3990 X=X+2
4000 LOCATE X,5:PRINT USING "CASH VAR. EXP. PER ACRE : $$###.##";SUMCCVE:LOCATE
X,43:PRINT USING "CASH VAR. EXP. PER ACRE : $$###.##";SUMSCVE
4010 X=X+2
4020 LOCATE X,5:PRINT USING "EXP. GR. MARG. PER ACRE : $$###.##";EGMPAC:LOCATE X
,43:PRINT USING "EXP. GR. MARG. PER ACRE : $$###.##";EGMPAS
4030 X=X+2
4040 LOCATE X,5:PRINT USING "FORWARD CONTRACTED PERCENT : ## %";FCCP:LOCATE X,43
:PRINT USING "FORWARD CONTRACTED PERCENT : ## %";FCSP
4050 X=X+2:Y=X
4060 IF SELC = 10 THEN LOCATE X,5:PRINT "ALL-RISK INSURANCE  :  NO":LOCATE 18,9:
PRINT USING "Cash Flow Exp.   : $$###,###";CFXPC:GOTO 4130:ELSE LOCATE X,5:PRINT
 "ALL-RISK INSURANCE  :  YES"
4070 X=X+2
4080 LOCATE X,9:PRINT USING "Guaranteed Yield :   ### BU";GYC:X=X+1
4090 LOCATE X,9:PRINT USING "Indemnity Price  :   $$#.##";IPC:X=X+1
4100 LOCATE X,9:PRINT USING "Premium Cost     :  $$##.## AC";PREMC:X=X+1
4110 LOCATE X,9:PRINT "Odds of Payoff   :    1 in";INT(1/PROBC):X=X+1
4120 LOCATE X,9:PRINT USING "Cash Flow Exp.   : $$###,###";CFXPC:X=X+1
4130 IF SELS = 10 THEN LOCATE Y,43:PRINT "ALL-RISK INSURANCE  :  NO":LOCATE 18,4
7:PRINT USING "Cash Flow Exp.   : $$###,###";CFXPS:GOTO 4200:ELSE LOCATE Y,43:PR
INT "ALL-RISK INSURANCE  :  YES":
4140 Y=Y+2
4150 LOCATE Y,47:PRINT USING "Guaranteed Yield :   ### BU";GYS:Y=Y+1
4160 LOCATE Y,47:PRINT USING "Indemnity Price  :   $$#.##";IPS:Y=Y+1
4170 LOCATE Y,47:PRINT USING "Premium Cost     :  $$##.## AC";PREMS:Y=Y+1
4180 LOCATE Y,47:PRINT "Odds of Payoff   :    1 in";INT(1/PROBS):Y=Y+1
4190 LOCATE Y,47:PRINT USING "Cash Flow Exp.   : $$###,###";CFXPS:Y=Y+1
```



```
4200 LOCATE 1,26:PRINT"  SUMMARY INFORMATION:";YEAR
4210 Y=Y+1
4220 LOCATE 24,14:PRINT" PRESS < C > TO CONTINUE OR SHIFT PRTSC FOR HARD COPY ";
4221 C$=" cC"
4222 D$=INKEY$:IF INSTR(C$,D$) < 2 THEN 4222
4224 RETURN
```

```
10 REM ***************          MODULE No. 4          ***************
20 REM ***************  DATE LAST UPDATED  12/02/88  ***************
30 REM ***************  DATE LAST PRINTED  12/02/88  ***************
40 REM ***************  TIME LAST PRINTED  05:45 PM  ***************
337 REM INITIALIZATION OF VARIABLES
340 AVEGAMMA=.2:IT=0:FLAG.GAMMA=0:GAMMA1S.I=GAMMA1S:TEMPCCVE.C2=CCVE(C,2):TEMPSC
VE.S2=SCVE(S,2):REM REPFAC.C=AVEGAMMA*TEMPCCVE.C2:REPFAC.S=AVEGAMMA*TEMPSCVE.S2
350 REM GAMMA INCREMENTATION SUBROUTINE
360 GOSUB 600
370 IF FLAG.GAMMA=1 THEN GOTO 7350: ELSE IT=IT+1:IF IT >12 THEN IT=IT-1:GOTO 735
0:REM 7 > 12
390 VOLLIQU.IT=0:IF IT=1 THEN GAMMA1S.I=GAMMA1S:ELSE GAMMA1S.I=.125+(GAMINC*(IT-
1)):REM RANGE 15%-40%
410 SASSET.IT=(GAMMA1S.I*(ASSET.PLR+ASSET.L))
420 IF INT(SASSET.IT)=INT(SASSET.I) THEN GOTO 3390
430 IF SASSET.IT > ASSET.I THEN GOTO 470:ELSE IF SASSET.IT < SASSET.I THEN GOTO
440
440 VOLLIQU.IT=(ASSET.I-SASSET.IT)
450 GOSUB 1250
460 GOTO 3390
470 REM CALC MAXASSETP.ISC
480 MAXASSETP.ISC=AVAILASS.C/CASHDP.I
490 REM MAXASSETP.ISD
500 IF SCRDRESR.I < SCRDRESR.W THEN MAXASSETP.ISD=SCRDRESR.I/(1-CASHDP.I):ELSE M
AXASSETP.ISD=SCRDRESR.W/(1-CASHDP.I)
510 IF MAXASSETP.ISC < MAXASSETP.ISD THEN MAXASSETP.IS=MAXASSETP.ISC:ELSE MAXASS
ETP.IS=MAXASSETP.ISD
520 IF MAXASSETP.IS > (SASSET.IT-ASSET.I) THEN MAXASSETP.IS=(SASSET.IT-ASSET.I):
GOSUB 1250:GOTO 3390
530 FLAG.GAMMA=1
540 SASSET.IT=MAXASSETP.IS
550 GAMMA1S.I=(ASSET.I+MAXASSETP.IS)/(ASSET.L+ASSET.PLR)
560 PRINT"FIRM HAS EXHAUSTED AVAILABLE CRDT RESERVE. A MACHINERY TO LAND RATIO O
F ";GAMMA1S.I;" IS THE MAXIMUM AT THIS TIME"
570 GOSUB 1250
580 GOTO 3390
600 REM
620 ASSETP.LO=0:ASSET.LR=0:ASSETP.IRA=0:ASSETP.IO=0:MAXASSETP.IS=0
640 VOLLIQU.T=0:SVOLLCB.L=0:VOLLIQU.I=0:VOLLIQU.C=0:VOLLIQU.LR=0:VOLLIQU.IT=0:VO
LLIQU.LO=0:SLIQSHT=0:SVOLLRES=0:SNETVOLL.I=0:SNETVOLL.L=0
650 REM RESET SSUMRED
660 SSUMRED=SUMRED:SVOLLIQU.LO=VOLLIQU.LO
670 SPAR=PAR:SP=P:FOR I=1 TO SP:SCBASE.L(I)=CBASE.L(I):SASSETP.L(I)=ASSETP.L(I):
NEXT I
690 SVOLLCB.L=(SVOLLIQU.LO+SLIQSHT+SVOLLRES)/(SASSETP.L(SPAR))
700 SLIQSHT=0:SVOLLRES=0
710 IF SVOLLCB.L=0 THEN GOTO 780
730 VSASSET.L=SASSET.L
740 IF SVOLLCB.L>1 THEN 990
750 SSUMRED=SUMRED+SVOLLCB.L
760 IF SSUMRED>=1 THEN GOTO 870:ELSE GOTO 820
780 SASSET.L=ASSET.L+ASSETP.LO:SCBASET.L=CBASET.L+ASSETP.LO
800 GOTO 1080
820 SCBASE.L(SPAR)=SCBASE.L(SPAR)*(1-SSUMRED)
830 SASSETP.L(SPAR)=SASSETP.L(SPAR)*(1-SSUMRED)
840 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
850 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
```

```
860 GOTO 1080
870 REM LIQSHT
880 SLIQSHT=(SSUMRED-1)*SASSETP.L(SPAR)
890 IF SSUMRED>=1 THEN SCBASE.L(SPAR)=0:SASSETP.L(SPAR)=0:SSUMRED=0:SVOLLIQU.LO=
0
900 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
910 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
920 REM BANKRUPTCY TEST
930 SPAR=SPAR+1
940 IF SPAR > SP THEN GOTO 1840
950 REM
960 GOTO 690
970 REM VOLLCB.L>1
990 SVOLLRES=SVOLLIQU.LO-SASSETP.L(SPAR)
1000 SCBASE.L(SPAR)=0:SASSETP.L(SPAR)=0:SSUMRED=0:SVOLLIQU.LO=0
1010 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
1020 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
1030 SPAR=SPAR+1
1040 IF SPAR>SP THEN PRINT"GOTO BANKRUPTCY ROUTINE":GOTO 1840
1050 GOTO 690
1060 IF (VOLLIQU.LO*(1-ROW.L)) < (DBT.L+ASSETP.LO*(1-CASHDP.L)) THEN GOTO 1080:E
LSE GOTO 1070
1070 SNETVOLL.L=(VOLLIQU.LO*(1-ROW.L))-(SDBT.L+ASSETP.LO*(1-CASHDP.L))
1080 SCCGT.L=(SASSET.L-SCBASET.L)*TAXRATE
1090 IF (VOLLIQU.LO*(1-ROW.L))>=(DBT.L+ASSETP.LO*(1-CASHDP.L)) THEN SDBT.L=0:GOT
O 1110: ELSE GOTO 1100
1100 SDBT.L=DBT.L+ASSETP.LO*(1-CASHDP.L)-(1-ROW.L)*VOLLIQU.LO-SPPDBT.L
1110 SCP.L=(1/TERM.L)*SDBT.L
1120 SLPDBT.L=SDBT.L-SCP.L
1130 STDBT.L=SLPDBT.L+SCCGT.L
1140 SEQTPOS.L=SASSET.L-SDBT.L
1150 SEQTPOSM.L=SASSET.L-(SDBT.L+SCCGT.L)
1160 SCRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*SEQTPOS.L-SDBT.L
1170 SCRDRESM.L=((1-ROW.L)/ROW.L)*SEQTPOSM.L-(SDBT.L+SCCGT.L)
1190 IF VOLLIQU.LO>0 THEN TAO=AO + (ASSETP.LO/PPPA) - (VOLLIQU.LO/(VSASSET.L/AO)
):ELSE TAO=AO + (ASSETP.LO/PPPA)
1200 REM TAO=AO + (ASSETP.LO/PPPA)- (VOLLIQU.LO/(VSASSET.L/AO))
1210 TAR=AR+(ASSET.LR/PPRA)-(VOLLIQU.LR/PPRA)
1220 SASSET.PLR=ASSET.PLR-VOLLIQU.LR
1230 ASSET.LRT=SASSET.PLR+ASSET.LR
1240 IF TAO>0 THEN SPPRA=SASSET.L/TAO: ELSE SPPRA=20*RRPA
1250 REM
1260 IF ((VOLLIQU.I+VOLLIQU.IT)*(1-ROW.I))<(DBT.I+((ASSETP.IRA+MAXASSETP.IS)*(1-
CASHDP.I))+ASSETP.IO*(1-CASHDP.I)) THEN GOTO 1280 ELSE 1270
1270 SNETVOLL.I=((VOLLIQU.I+VOLLIQU.IT)*(1-ROW.I))-(SDBT.I+(ASSETP.IRA+MAXASSETP
.IS+ASSETP.IO)*(1-CASHDP.I))
1280 SASSET.I=ASSET.I+ASSETP.IRA+MAXASSETP.IS+ASSETP.IO-VOLLIQU.IT-VOLLIQU.I-VOL
LIQMIN.I
1290 SMEMV=SASSET.I
1300 SMECB=MECB+ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-((MECB/MEMV)*(VOLLIQU.I+VOLLIQ
U.IT))
1310 SMEBV=MEBV+ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-((MEBV/MEMV)*(VOLLIQU.I+VOLLIQ
U.IT))
1320 SACCDEP=SMECB-SMEBV
1330 SCCGT.I=(SASSET.I-SMEBV)*TAXRATE
1340 IF ((VOLLIQU.I+VOLLIQU.IT)*(1-ROW.I))>=(DBT.I+((ASSETP.IRA+MAXASSETP.IS)*(1
-CASHDP.I))+ASSETP.IO*(1-CASHDP.I)) THEN SDBT.I=0:GOTO 1360: ELSE GOTO 1350
1350 SDBT.I=DBT.I+((ASSETP.IRA+MAXASSETP.IS)*(1-CASHDP.I))+ASSETP.IO*(1-CASHDP.I
)-VOLLIQU.I*(1-ROW.I)-VOLLIQU.IT*(1-ROW.I)-SPPDBT.I
1360 SCP.I=(1/TERM.I)*SDBT.I
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```
1370 SLPDBT.I=SDBT.I-SCR.I
1380 STDBT.I=SLPDBT.I+SCCGT.I
1390 SEQTPOS.I=SASSET.I-SDBT.I
1400 SEQTPOSM.I=SASSET.I-(SDBT.I+SCCGT.I)
1410 SCRDRESR.I=((1-ROW.I)*(1-DEL.I)/ROW.I)*SEQTPOS.I-SDBT.I
1420 SCRDRESM.I=((1-ROW.I)/ROW.I)*SEQTPOSM.I-(SDBT.I+SCCGT.I)
1440 IF SASSET.PLR = 0 AND ASSET.LR=0 THEN SPPDLEASE=0:ELSE SPPDLEASE=(TAR)*RRPA
1450 IF SASSET.PLR= 0 AND ASSET.LR=0 THEN SLEAPAY.C=0:ELSE SLEAPAY.C=(TAR)*RRPA*
.5
1460 SASSET.C=ASSET.C-((ASSETP.IRA+MAXASSETP.IS)*CASHDP.I)-(ASSETP.IO*CASHDP.I)-
(ASSETP.LO*CASHDP.L)-SPPDBT.T+SNETVOLL.I+SNETVOLL.L
1470 STASSET.C=SASSET.C+SPPDLEASE
1480 SDBT.C=DBT.C-SPPDBT.C+((ASSET.LR/PPRA)*RRPA*.5)
1490 STDBT.C=SDBT.C+SCP.I+SCP.L+SLEAPAY.C
1500 SEQTPOS.C=STASSET.C-(SDBT.C+SLEAPAY.C)
1510 SAEQTPOS.C=STASSET.C-(SDBT.C+SLEAPAY.C)*MINRATIO.C
1520 SEQTPOSM.C=STASSET.C-(SDBT.C+SLEAPAY.C)
1530 SMINEQTPOS.C=(STDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
1540 SCRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*SEQTPOS.C-(SDBT.C+SLEAPAY.C)
1550 SCRDRESM.C=((1-ROW.C)/ROW.C)*SEQTPOSM.C-(SDBT.C+SLEAPAY.C)
1560 SAVAILASS.C=SAEQTPOS.C-SMINEQTPOS.C
1570 SCURRATIO=STASSET.C/STDBT.C
1600 STASSET.CB=STASSET.C+SMEBV+SCBASET.L
1610 STASSETS.M=STASSET.C+SASSET.I+SASSET.L
1620 TASSETS.M=TASSET.C+TASSET.I+ASSET.L
1630 STDBT.CB=STDBT.C+SLPDBT.I+SLPDBT.L
1640 STDBT.M=STDBT.C+STDBT.I+STDBT.L
1650 STEQTPOS.CB=STASSET.CB-STDBT.CB
1660 STEQTPOS.M=STASSETS.M-STDBT.M
1670 SINDBT.L=SDBT.L*IN.L
1680 SINDBT.I=SDBT.I*IN.I
1690 SINDBT.C=SDBT.C*IN.C
1700 TASSETS.TA=TASSETS.M+ASSET.PLR
1710 STASSETS.TA=STASSETS.M+(SASSET.PLR+ASSET.LR)
1720 TSCRDRESR.C=RCRDRESR.C=0
1740 TXASSET.I=ASSET.I:TXSASSET.I=SASSET.I:TXMEBV=MEBV:TXSMEBV=SMEBV
1750 TXASSET.L=ASSET.L:TXSASSET.L=SASSET.L:TXCBASET.L=CBASET.L:TXSCBASET.L=SCBAS
ET.L
1760 ROW.WE0=((ROW.I*GAMMA1S.I+ROW.L)*((STASSETS.M)-STASSET.C-GAMMA1S.I*ASSET.LR
T))/((1+GAMMA1S.I)*(STASSETS.M))+(ROW.I*GAMMA1S.I*ASSET.LRT+ROW.C*STASSET.C)/(ST
ASSETS.M)
1770 DEL.WE0=((DEL.I*GAMMA1S.I+DEL.L)*((STASSETS.M)-STASSET.C-GAMMA1S.I*ASSET.LR
T))/((1+GAMMA1S.I)*(STASSETS.M))+(DEL.I*GAMMA1S.I*ASSET.LRT+DEL.C*STASSET.C)/(ST
ASSETS.M)
1790 SCRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*STEQTPOS.M-STDBT.M
1800 SCRDRESM.W=((1-ROW.WE0)/ROW.WE0)*STEQTPOS.M-STDBT.M
1810 SUMMINCR=MINCR.C+MINCR.I+MINCR.L
1820 MAXER.W=(SCRDRESR.W-SUMMINCR)/((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0+1)
1830 MAXEM.W=(((1-ROW.WE0)*STEQTPOS.M-ROW.WE0*STDBT.M-MAXER.W)-(SUMMINCR/((1-ROW
.WE0)*(1-DEL.WE0)/ROW.WE0+1)))*(1-ROW.WE0)+(SUMMINCR/((1-ROW.WE0)*(1-DEL.WE0)/RO
W.WE0+1))+MAXER.W
1835 PIPMT=CP.I+CP.L+INDBT.I+INDBT.L
1840 REM
1850 IF (1-ROW.WE0)*STASSETS.M <= STDBT.M THEN SASSET.C=0:SASSET.I=0:SASSET.L=0:
SDBT.C=0:SDBT.I=0:SDBT.L=0:CLS:LOCATE 15,20:PRINT "SORRY, BUT YOU'RE BANKRUPT !
TRY AGAIN ... ":STOP
1860 IF SPAR > SP THEN:STOP
1870 REM
1880 RETURN
1890 REM TEMP ACCOUNTS
```

```
1895 RIS=RI
1896 REM NEXT J
1898 FOR J=1 TO RIS
1899 NEXT J
1940 TTOTA=TAO+TAR
1950 TTOTACRN=TTOTA*CAP/100
1960 TTOTASYB=TTOTA*SAP/100
1970 SUMCCVE=0:SUMSCVE=0
1973 REPFAC.C=AVEGAMMA*CCVE(C,2):REPFAC.S=AVEGAMMA*SCVE(S,2)
1975 CCVE(C,2)=REPFAC.C/GAMMA1S.I:SCVE(S,2)=REPFAC.S/GAMMA1S.I
1980 IF TTOTA <100 THEN ACRES=1:ELSE IF TTOTA <180 THEN ACRES=2:ELSE IF TTOTA <2
60 THEN ACRES=3:ELSE IF TTOTA <500 THEN ACRES=4:ELSE IF TTOTA <1000 THEN ACRES=5
:ELSE ACRES=6
1990 FOR I=1 TO 12
2000 IF I>2 AND I<6 THEN CCVE(C,I)=CCVE(C,I)*(1-DISFAC(I,ACRES)):SCVE(S,I)=SCVE(
S,I)*(1-DISFAC(I,ACRES))
2010 SUMCCVE=SUMCCVE+CCVE(C,I):SUMSCVE=SUMSCVE+SCVE(S,I)
2020 NEXT I
2030 TAXPA=CFE(2)/AO:TTAXPA=TAXPA
2040 INSPA=CFE(4)/TOTA:TINSPA=INSPA
2042 IF ASSET.LR=0 AND VOLLIQU.LR=0 GOTO 2054
2044 IF ASSET.LR=0 AND VOLLIQU.LR>0 GOTO 2050
2046 IF ASSET.LR>0 AND VOLLIQU.LR=0 GOTO 2052
2050 TCFE(1)=CFE(1)-((VOLLIQU.LR/PPRA)*RRPA):GOTO 2056
2052 TCFE(1)=CFE(1)+(ASSET.LR/PPRA*RRPA):GOTO 2056
2054 TCFE(1)=CFE(1):GOTO 2056
2056 IF ASSETP.LO=0 AND VOLLIQU.LI=0 THEN GOTO 2062
2058 IF ASSETP.LO=0 AND VOLLIQU.LI>0 THEN GOTO 2064
2060 IF ASSETP.LO>0 AND VOLLIQU.LI=0 THEN GOTO 2066
2062 TCFE(2)=CFE(2):GOTO 2068
2064 TCFE(2)=CFE(2)-TAXPA*(VOLLIQU.LO/(SASSET.L/AO)):GOTO 2070
2066 TCFE(2)=CFE(2)+TAXPA*(ASSETP.LO/PPPA):GOTO 2072
2068 TCFE(4)=CFE(4):GOTO 2080
2070 TCFE(4)=CFE(4)-INSPA*((VOLLIQU.LR/PPRA)-(VOLLIQU.LO/(SASSET.L/AO))):GOTO 20
80
2072 TCFE(4)=CFE(4)+INSPA*((ASSET.LR/PPRA)+(ASSETP.LO/PPPA)):GOTO 2080
2080 TSUMCFE=CFE(3)+CFE(5)+TCFE(1)+TCFE(2)+TCFE(4)
2090 SOPIN.C=(SUMCCVE + PREMC + ((TSUMCFE*(CAP/100))/TTOTACRN))*(IN.C*.5)
2100 SOPIN.S=(SUMSCVE + PREMS + ((TSUMCFE*(SAP/100))/TTOTASYB))*(IN.C*.5)
2110 SCFXPC=((EPC*(GYC-1))+IPC*1-SUMCCVE-PREMC)*TTOTACRN-(TSUMCFE*CAP/100)-(SDBT
.C*IN.C*CAP/100)-(SDBT.I*IN.I*CAP/100)-(SDBT.L*IN.L*CAP/100)-SOPIN.C*TTOTACRN
2120 SCFXPS=((EPS*(GYS-1))+IPS*1-SUMSCVE-PREMS)*TTOTASYB-(TSUMCFE*SAP/100)-(SDBT
.C*IN.C*SAP/100)-(SDBT.I*IN.I*SAP/100)-(SDBT.L*IN.L*SAP/100)-SOPIN.C*TTOTASYB
2130 SNOINSRC=-(SUMCCVE*TTOTACRN*.45)-(TSUMCFE*CAP/100)-(SDBT.I*IN.I*CAP/100)-(S
DBT.L*IN.L*CAP/100)-(SDBT.C*IN.C*CAP/100)-SOPIN.C*TTOTACRN
2140 SNOINSRS=-(SUMSCVE*TTOTASYB*.65)-(TSUMCFE*SAP/100)-(SDBT.I*IN.I*SAP/100)-(S
DBT.L*IN.L*SAP/100)-(SDBT.C*IN.C*SAP/100)-SOPIN.S*TTOTASYB
2150 REM CALC RI/EI 'S
2155 CLS:LOCATE 10,14:PRINT USING"CURRENTLY EVALUATING A MACHINERY-TO-LAND RATIO
 of= ###.### %";(GAMMA1S.I*100)
2161 LOCATE 14,14:PRINT "Calculating Prices and Yields ";
2170 RSUM=0:SDC=TMCC*.25:SDS=TMCS*.25:SDPRC=EPC*.102:SDPRS=EPS*6.800001E-02
2181 RIS=RI
2182 FOR J= 1 TO RIS: PRINT ".";
2183 TIM=VAL(RIGHT$(TIME$,2))
2184 IF SIGN=-1 THEN TIM=-TIM:SIGN=1:ELSE SIGN=-1
2185 RANDOMIZE TIM
2195 REM YIELDS
2200 FOR I= 1 TO 2
2210 SM=0
```

```
2220 FOR KK=1 TO 12
2240 R=RND(1)
2250 SM=SM+R
2260 NEXT KK
2270 VO=SM-6
2275 IF VO > 2 THEN VO=2
2280 RV(I)=VO
2290 IF I=1 THEN STOYC=SDC*RV(I)+TYLDC*1.15*(1-LN^(-8.25*GAMMA1S.I))ELSE STOYS=S
DS*(CC1*RV(I-1)+((1-CC1*CC1)^.5)*RV(I))+TYLDS*1.15*(1-LN^(-8.25*GAMMA1S.I)):REM
TMCC&TMCS REPLACED WITH TYLDC&TYLDS
2300 NEXT I
2310 REM PRICES
2320 FOR I=1 TO 2
2330 SM=0
2340 FOR KK=1 TO 12
2360 R=RND(1)
2370 SM=SM+R
2380 NEXT KK
2390 VO=SM-6
2400 RV(I)=VO
2410 IF I=1 THEN STOPC=SDPRC*RV(I)+EPC ELSE STOPS=SDPRS*(CC2*RV(I-1)+((1-CC2*CC2
)^.5)*RV(I))+EPS
2420 NEXT I
2426 REM LPRINT "- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - - -";:LPRINT
2428 REM LPRINT USING" CORN: EXPECTED= $$###.##  RANDOM PRICE= $$###.##  RANDOM
YIELD= ###";EPC;STOPC;STOYC
2429 REM LPRINT USING" SOYBEANS: EXPECTED= $$###.## RANDOM PRICE= $$###.##  RAND
OM YIELD= ###";EPS;STOPS;STOYS
2430 REM LPRINT USING"TREND YIELDS: CORN= ###  SOYBEANS= ###";TYLDC;TYLDS
2440 IF STOYC<GYC THEN TQC=TTOTACRN*GYC:ELSE TQC=TTOTACRN*STOYC
2450 IF STOYS<GYS THEN TQS=TTOTASYB*GYS:ELSE TQS=TTOTASYB*STOYS
2460 IF STOYC < GYC AND STOPC<IPC THEN STOPC=IPC
2470 IF STOYS < GYS AND STOPS<IPS THEN STOPS=IPS
2490 IF TQC>QCC THEN GRC=QCC*EPC+STOPC*(TQC-QCC):ELSE GRC=QCC*STOPC
2510 IF TQC > QCC AND STOYC > BEHYC AND STOYC > GYC THEN GOTO 2590
2520 IF TQC > QCC AND STOYC > BEHYC AND STOYC < GYC THEN GOTO 2640
2530 IF TQC > QCC AND STOYC < BEHYC AND STOYC > GYC THEN GOTO 2620
2540 IF TQC > QCC AND STOYC < BEHYC AND STOYC < GYC THEN GOTO 2650
2550 IF TQC < QCC AND STOYC > BEHYC AND STOYC > GYC THEN GOTO 2600
2560 IF TQC < QCC AND STOYC > BEHYC AND STOYC < GYC THEN GOTO 2610
2570 IF TQC < QCC AND STOYC < BEHYC AND STOYC > GYC THEN GOTO 2630
2580 IF TQC < QCC AND STOYC < BEHYC AND STOYC < GYC THEN GOTO 2660
2590 GMC=GRC-(SUMCCVE+PREMC+SOPIN.C)*TTOTACRN:GOTO 2700
2600 GMC=GRC-(SUMCCVE+PREMC+SOPIN.C)*TTOTACRN-STOPC*(QCC-TQC)*(1+CTCF):GOTO 2700
2610 GMC=GRC-(SUMCCVE+PREMC+SOPIN.C)*TTOTACRN-STOPC*(QCC-TQC)*(1+CTCF)+IPC*(GYC-
STOYC)*TTOTACRN:GOTO 2700
2620 GOSUB 2670:GMC=GRC-(GMC1+GMC2):GOTO 2700
2630 GOSUB 2670:GMC=GRC-(GMC1+GMC2)-STOPC*(QCC-TQC)*(1+CTCF):GOTO 2700
2640 GMC=GRC-(SUMCCVE+PREMC+SOPIN.C)*TTOTACRN+IPC*(GYC-STOYC)*TTOTACRN:GOTO 2700
2650 GOSUB 2670:GMC=GRC-(GMC1+GMC2)+IPC*(GYC-STOYC)*TTOTACRN:GOTO 2700
2660 GOSUB 2670:GMC=GRC-(GMC1+GMC2)+IPC*(GYC-STOYC)*TTOTACRN-STOPC*(QCC-TQC)*(1+
CTCF):GOTO 2700
2670 GMC1=(CCVE(C,3)+CCVE(C,4)+CCVE(C,5)+PREMC)+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+C
CVE(C,8)+CCVE(C,11)+CCVE(C,12))*.25+CCVE(C,9)*.5
2680 GMC2=((CCVE(C,3)+CCVE(C,4)+CCVE(C,5)+PREMC)+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+
CCVE(C,8)+CCVE(C,11)+CCVE(C,12))*.25+CCVE(C,9)*.5)*(IN.C*.5)*TTOTACRN
2685 RETURN
2700 IF TQS>QCS THEN GRS=QCS*EPS+STOPS*(TQS-QCS):ELSE GRS=QCS*STOPS
2720 IF TQS > QCS AND STOYS > BEHYS AND STOYS > GYS THEN GOTO 2800
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2730 IF TQS > QCS AND STOYS > BEHYS AND STOYS < GYS THEN GOTO 2850
2740 IF TQS > QCS AND STOYS < BEHYS AND STOYS > GYS THEN GOTO 2830
2750 IF TQS > QCS AND STOYS < BEHYS AND STOYS < GYS THEN GOTO 2860
2760 IF TQS < QCS AND STOYS > BEHYS AND STOYS > GYS THEN GOTO 2810
2770 IF TQS < QCS AND STOYS > BEHYS AND STOYS < GYS THEN GOTO 2820
2780 IF TQS < QCS AND STOYS < BEHYS AND STOYS > GYS THEN GOTO 2840
2790 IF TQS < QCS AND STOYS < BEHYS AND STOYS < GYS THEN GOTO 2870
2800 GMS=GRS-(SUMSCVE+PREMS+SOPIN.S)*TTOTASYB:GOTO 2910
2810 GMS=GRS-(SUMSCVE+PREMS+SOPIN.S)*TTOTASYB-STOPS*(QSC-TQS)*(1+STCF):GOTO 2910
2820 GMS=GRS-(SUMSCVE+PREMS+SOPIN.S)*TTOTASYB-STOPS*(QSC-TQS)*(1+STCF)+IPS*(GYS-
STOYS)*TTOTASYB:GOTO 2910
2830 GOSUB 2880:GMS=GRS-(GMS1+GMS2):GOTO 2910
2840 GOSUB 2880:GMS=GRS-(GMS1+GMS2)-STOPS*(QSC-TQS)*(1+STCF):GOTO 2910
2850 GMS=GRS-(SUMSCVE+PREMS+OPIN.C)*TTOTASYB+IPS*(GYS-STOYS)*TTOTASYB:GOTO 2910
2860 GOSUB 2880:GMS=GRS-(GMS1+GMS2)+IPS*(GYS-STOYS)*TTOTASYB:GOTO 2910
2870 GOSUB 2880:GMS=GRS-(GMS1+GMS2)+IPS*(GYS-STOYS)*TTOTASYB-STOPS*(QSC-TQS)*(1+
STCF):GOTO 2910
2880 GMS1=(SCVE(S,3)+SCVE(S,4)+SCVE(S,5)+PREMS)+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+S
CVE(S,8)+SCVE(S,11)+SCVE(S,12))*.25+SCVE(S,9)*.5
2890 GMS2=((SCVE(S,3)+SCVE(S,4)+SCVE(S,5)+PREMS)+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+
SCVE(S,8)+SCVE(S,11)+SCVE(S,12))*.25+SCVE(S,9)*.5)*(IN.C*.5)*TTOTASYB
2895 RETURN
2910 TOTGM=GMC+GMS
2915 GMCPA=GMC/TOTACRN
2916 GMSPA=GMS/TOTASYB
2940 STROWCOST=ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQU.I+VOLLIQMIN.I)+RO
W.L*(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.LO)+ROW.C*VOLLIQU.C+VOLLIQU.IT*ROW.I
2944 IF GYC > 0 AND STOYC < GYC THEN SINSPMTC=IPC*(GYC-STOYC)*TOTACRN: ELSE SINS
PMTC=0
2946 IF GYS > 0 AND STOYS < GYS THEN SINSPMTS=IPS*(GYS-STOYS)*TOTASYB: ELSE SINS
PMTS=0
2960 SDEPREC=INT(SMEBV-(SMEBV/(1+DEPRATE)))
2980 ISTXGAIN=((TXASSET.L-TXSASSET.L)-(TXCBASET.L-TXSCBASET.L))+((TXASSET.I-TXSA
SSET.I)-(TXMECB-TXSMECB))
2983 IF STXGAIN <= 0 AND STXGAIN > -100 THEN STXGAIN=0:ELSE STXGAIN=ISTXGAIN
2988 OPLABOR=2080*(6.6*CUMINFLA(CYCLE))
2990 NIBT=TOTGM-TSUMCFE-SDEPREC-SINDBT.C-SINDBT.I-SINDBT.L-STROWCOST+STXGAIN+OPL
ABOR-REFINCOST-SINSPMTC-SINSPMTS
2996 TINTEARN=(TASSET.C-MINRATIO.C*TDBT.C)*RFRR
2997 IF TINTEARN>0 THEN INTEARN=TINTEARN:ELSE INTEARN=0
3000 ADJINC=NIBT+NONFINC+INTEARN
3010 EXEMP=2000*NUMDEP
3020 PTAXINC=ADJINC-EXEMP-5000
3021 SBAITC=BAITC
3022 IF PTAXINC > SBAITC THEN TAXINC=PTAXINC-SBAITC:GOTO 3030
3023 IF PTAXINC > 0 AND PTAXINC < SBAITC THEN TAXINC=0:GOTO 3030
3025 IF PTAXINC<=0 THEN TAXINC=0
3030 IF TAXINC >= 0 AND TAXINC <= 29750 THEN TAX=TAXINC*.15:GOTO 3080
3040 IF TAXINC >= 29751 AND TAXINC <= 71900! THEN TAX=TAXINC*.28:GOTO 3080
3050 IF TAXINC >= 71901! AND TAXINC <= 171090! THEN TAX=TAXINC*.33:GOTO 3080
3060 IF TAXINC >=171091! THEN TAX=TAXINC*.28
3080 REM FICA
3090 IF TAXINC <= 43800! THEN SSTAX=TAXINC*.1302:ELSE SSTAX=5387:REM 13.02 1988
SELF EMPLOYED SOCIAL SECURITY TAX RATE
3110 STATETAX=.046*TAXINC
3210 TOTTAX=INT(TAX+STATETAX+SSTAX)
3230 IF TOTTAX <= 0 THEN TOTTAX =0
3240 NIAT=PTAXINC-TOTTAX+SINSPMTC+SINSPMTS
3250 NRRA=NIBT+SINDBT.I+SINDBT.L+SINDBT.C+INTEARN+NONFINC+SINSPMTS+SINSPMTC
3265 RI(J)=NRRA/STASSETS.M
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3266 REM LPRINT"RI(J)";RI(J)
3270 RSUM=RSUM+RI(J)
3275 REM NEXT J
3280 IF J < RIS THEN FLAG.RIS=0:ELSE FLAG.RIS=1
3281 IF FLAG.RIS=0 THEN NEXT J:ELSE GOTO 3290
3290 RBAR=RSUM/RIS
3295 IF FLAG.RIS=0 THEN STOYC=TMCC:STOYS=TMCS:STOPC=EPC:STOPS=EPS:FLAG.RIS=1:GOT
O 2430
3300 REM FLAG.RIS=1
3311 LOCATE 18,14:PRINT "Calculation oF EI'S For An R-BAR of: ";(RBAR*100)
3314 LPRINT
3315 REM CALCULATION OF EI(J)
3320 FOR J= 1 TO RIS:EI(J)=RI(J)-RBAR
3324 LPRINT"EI(J)= ";EI(J);:NEXT J
3325 LPRINT:LPRINT
3340 FOR I=3 TO 5:CCVE(C,I)=CCVE(C,I)/(1-DISFAC(I,ACRES)):SCVE(S,I)=SCVE(S,I)/(1
-DISFAC(I,ACRES))
3350 NEXT I
3355 CCVE(C,2)=TEMPCCVE.C2:SCVE(S,2)=TEMPSCVE.S2
3360 RETURN
3380 REM
3390 GOSUB 1890
3410 GOSUB 4370
3430 INI.EU#=EU#:INI.DBT=STDBT.M:INI.AP=0:INI.S=T:INI.RBAR=RBAR
3433 INIASSET.LR=0:INIASSETP.IRA=0:INIASSETP.IO=0:INIASSETP.LO=0:INIVOLLIQU.IT=V
OLLIQU.IT:INIMAXAS.IS=MAXASSETP.IS
3435 REM
3436 GOSUB 4820:INI.ACT#=EUACTUAL#
3439 GOSUB 7900
3450 REM
3471 IF ((RAL=0 AND PAL=0) OR FLAG.GAMMA=1) AND (INI.EU# > 0 ) THEN OPT.EU#=INI.
EU#:L#=OPT.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.TYPE=1:GOTO 3476
3472 IF ((RAL=0 AND PAL=0) OR FLAG.GAMMA=1) AND (INI.EU# < 0)  THEN GOTO 5580: R
EM VOLLIQU ROUTINE
3473 GOTO 3490
3476 GOSUB 5400:GOTO 370
3490 IF RAL=0 THEN LOCATE 20,14:PRINT "The Option To Cash Lease Additional Land
Does Not Exist" :GOTO 3890:REM TO PURCHASE OPTION
3500 LOCATE 20,14:PRINT"Evaluating The Cash Leasing of Additional Land"
3510 NRA=RAL
3520 FOR Q=0 TO NRA STEP REN.INC
3530 ASSET.LRI=PPRA*Q
3540 ASSETP.IRAI=ASSET.LRI*GAMMA1S.I
3550 RAVAILASS.C=((STASSET.C-(ASSETP.IRAI*CASHDP.I))-(SDBT.C+SLEAPAY.C+(RRPA*Q))
)-(((SDBT.C+SCP.I+SCP.L+(RRPA*Q*.5)+SLEAPAY.C+MINCR.C)*ROW.C)/((1-ROW.C)*(1-DEL.
C)))
3560 IF RAVAILASS.C < 0 OR (ASSETP.IRAI*(1-CASHDP.I)) > SCRDRESR.I OR (Q*RRPA*.5
) > SCRDRESR.C THEN FLAG.MAXRENTAL=1:FLAG.Q=(Q-REN.INC):Q=NRA
3570 NEXT Q
3580 IF FLAG.MAXRENTAL=1 THEN MAXRENTAL=FLAG.Q: ELSE MAXRENTAL=Q-REN.INC
3590 ASSET.LR=PPRA*MAXRENTAL:ASSETP.IRA=ASSET.LR*GAMMA1S.I
3610 GOSUB 660
3630 GOSUB 1890
3650 SASSETP.TI=ASSETP.IRA+ASSET.LR+((ASSET.LR/PPRA)*RRPA)
3660 ASSETP=SASSETP.TI
3676 RASSET.LR=0:RASSETP.IRA=0:RRENBAR=0
3680 GOSUB 4370
3685 REN.EU#=EU#:REN.DBT=STDBT.M:REN.AP=ASSETP:REN.S=T:REN.RBAR=RBAR
3687 GOSUB 4820:REN.ACT#=EUACTUAL#
3688 GOSUB 7710
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3735 RENASSET.LR=ASSET.LR:RENASSETP.IRA=ASSETP.IRA:RENASSETP.IO=ASSETP.IO:RENASS
ETP.LO=ASSETP.LO:RENVOLLIQU.IT=VOLLIQU.IT:RENMAXAS.IS=MAXASSETP.IS
3738 RASSET.LR=ASSET.LR:RASSETP.IRA=ASSETP.IRA:RRENBAR=RBAR
3760 REM SIGN TESTS
3770 IF INI.S < > REN.S THEN GOTO 5010
3781 IF INI.S AND REN.S > 0 AND PAL > 0 AND FLAG.MAXRENTAL=0 THEN GOTO 3894:ELSE
 GOTO 3782
3782 IF ABS(INI.EU#) < ABS(REN.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI
.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:START.FLAG=1:GOSUB 7500:GOTO 5580:ELS
E GOTO 3783
3783 IF ABS(REN.EU#) < ABS(INI.EU#) THEN OPT.EU#=REN.EU#:L#=OPT.EU#:OPT.RBAR=REN
.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHOICE=2:START.FLAG=2:GOSUB 7510:GOTO 5582
3790 REM IF FLAG.MAXRENTAL=1 THEN FLAG.MAXRENTAL=0 ELSE 3880: REM +,+ AND TOOK 1
00% OF RENTAL GOTO PURCHASE
3800 REM ( +,+ )
3820 FLAG.TYPE=1
3825 REM
3826 GOSUB 4820
3830 IF ABS(INI.EU#) < ABS(REN.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI
.RBAR:OPT.ACT#=INI.ACT#:GOSUB 7500:GOTO 3840:ELSE GOTO 3831
3831 IF ABS(REN.EU#) < ABS(INI.EU#) THEN OPT.EU#=REN.EU#:L#=OPT.EU#:OPT.RBAR=REN
.RBAR:OPT.ACT#=REN.ACT#:GOSUB 7510
3840 GOSUB 5400
3850 GOTO  350
3880 REM
3890 IF RAL <> 0 AND PAL=0 THEN GOTO 3892:ELSE GOTO 3894
3892 IF PAL=0 THEN LOCATE 22,14:PRINT "The Option To Purchase Additional Land Do
es Not Exist" :GOTO 3800
3894 LOCATE 22,20:PRINT"Evaluating The Purchase of Additional Land":GOTO 3920
3920 NPA=PAL
3930 FOR Q= NPA TO 0 STEP -PUR.INC
3940 ASSETP.LOI=Q*PPPA
3950 ASSETP.IOI=ASSETP.LOI*GAMMA1S.I
3960 SPAVAILASS.P1=((STASSET.C-(ASSETP.IOI*CASHDP.I)-(ASSETP.LOI*CASHDP.L))-(SDB
T.C+SLEAPAY.C))
3970 SPAVAILASS.P2=-(((SDBT.C+SCP.I+SCP.L+SLEAPAY.C+MINCR.C+((ASSETP.IOI*(1-CASH
DP.I))/TERM.I)+((ASSETP.LOI*(1-CASHDP.L))/TERM.L))*MINRATIO.C*ROW.C)/((1-ROW.C)*
(1-DEL.C)))
3980 SPAVAILASS.C=(SPAVAILASS.P1+SPAVAILASS.P2)*.975:REM LPRINT "SPAVAILASS.C= "
;SPAVAILASS.C
3990 IF SPAVAILASS.C => 0 THEN MAXASSETP.TOC=(ASSETP.LOI*(1-CASHDP.L)+ASSETP.IOI
*(1-CASHDP.I)):Q=0
4000 NEXT Q
4020 BETA=(1/(1+GAMMA1S.I))
4040 MAXASSETP.TOD=SCRDRESR.W/((BETA*(1-CASHDP.L))+((1-BETA)*(1-CASHDP.I)))
4060 IF MAXASSETP.TOC > MAXASSETP.TOD THEN MAXASSETP.TOC=0:ASSETP.LO=MAXASSETP.T
OD*BETA:ELSE MAXASSETP.TOD=0:ASSETP.LO=MAXASSETP.TOC*BETA
4080 ASSETP.IO=(MAXASSETP.TOD+MAXASSETP.TOC)*(1-BETA)
4100 IF SCRDRESR.I > ASSETP.IO*(1-CASHDP.I) THEN 4110:ELSE 4120
4110 IF SCRDRESR.L > ASSETP.LO*(1-CASHDP.L) THEN 4140:ELSE ASSETP.LO=SCRDRESR.L/
(1-CASHDP.L):ASSETP.IO=ASSETP.LO*GAMMA1S.I:GOTO 4140
4120 IF SCRDRESR.L > ASSETP.LO*(1-CASHDP.L) THEN ASSETP.LO=(SCRDRESR.I/(1-CASHDP
.I))/GAMMA1S.I:GOTO 4140:ELSE GOTO 4130
4130 IF SCRDRESR.I < SCRDRESR.L THEN ASSETP.IO=SCRDRESR.I/(1-CASHDP.I):ASSETP.LO
=ASSETP.IO/GAMMA1S.I:GOTO 4140:ELSE ASSETP.LO=SCRDRESR.L/(1-CASHDP.L):ASSETP.IO=
ASSETP.LO*GAMMA1S.I:GOTO 4140
4140 IF ASSETP.LO > PPPA*PAL THEN ASSETP.LO=PPPA*PAL:ASSETP.IO=ASSETP.LO*GAMMA1S
.I
4160 GOSUB 660
4180 GOSUB 1890
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4200 SASSETP.TI=ASSETP.LO+ASSETP.LO
4210 ASSETP=SASSETP.TI
4220 REM EU(PUR)
4225 RASSETP.LO=0:RASSETP.IO=0:RPURBAR=0
4230 GOSUB 4370
4240 REM
4250 PUR.EU#=EU#:PUR.DBT=STDBT.M:PUR.AP=ASSETP:PUR.S=T:PUR.RBAR=RBAR
4256 GOSUB 4820:PUR.ACT#=EUACTUAL#
4258 PURASSET.LR=ASSET.LR:PURASSETP.IRA=ASSETP.IRA:PURASSETP.IO=ASSETP.IO:PURASS
ETP.LO=ASSETP.LO:PURVOLLIQU.IT=VOLLIQU.IT:PURMAXAS.IS=MAXASSETP.IS
4260 RASSETP.LO=ASSETP.LO:RASSETP.IO=ASSETP.IO:RPURBAR=RBAR
4262 GOSUB 7800
4310 REM TEST SIGN
4320 IF INI.S=REN.S AND REN.S=PUR.S THEN GOTO 6210
4330 IF INI.S > 0 AND RAL =0 AND PUR.S > 0 THEN GOTO 6310
4333 IF RAL =0 AND INI.S < > PUR.S THEN GOTO 6370
4335 IF INI.S > 0 AND REN.S > 0 AND PUR.S < 0  THEN GOTO 6370
4341 IF INI.S < 0 AND PUR.S < 0 GOTO 4342
4342 IF ABS(INI.EU#) < ABS(PUR.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI
.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:START.FLAG=3:GOSUB 7500:GOTO 5580:ELS
E GOTO 4344
4344 IF ABS(PUR.EU#) < ABS(INI.EU#) THEN OPT.EU#=PUR.EU#:L#=OPT.EU#:OPT.RBAR=PUR
.RBAR:OPT.ACT#=PUR.ACT#:FLAG.EUOPTCHOICE=3:START.FLAG=4:GOSUB 7520:GOTO 5580
4370 REM EU SUBROUTINE
4380 ASSET.LRT=SASSET.PLR+ASSET.LR
4390 SIN.W=(IN.C*SDBT.C+IN.I*SDBT.I+IN.L*SDBT.L)/STDBT.CB
4400 SINDBT.T=IN.C*SDBT.C+IN.I*SDBT.I+IN.L*SDBT.L
4410 STASSETS.TA=(STASSETS.M+ASSET.LRT)
4420 SVOLLIQUCOST=(ROW.I*(VOLLIQU.I+VOLLIQU.IT)+ROW.L*VOLLIQU.LO+VOLLIQU.C)
4425 WTHDRWLS=CASHOUT+EFAMLIVING
4430 REM CALCULATE EU
4450 UE0#=0:UE1#=0:DED=0:PRBBRY=0
4470 AC=(ROW.WE0*(STEQTPOS.M-SVOLLIQUCOST)+(1-ROW.WE0)*(1-DEL.WE0)*(STASSETS.TA)
)/((1-DEL.WE0*(1-ROW.WE0))*(STASSETS.TA)^2)+SIN.W*(STEQTPOS.M-ROW.WE0*(ASSETP.LO
+ASSETP.IRA+ASSETP.IO+(RRPA*.5*ASSETP.LR)/PPRA)-WTHDRWLS)/(STASSETS.TA)^2
4490 E0= (((ROW.WE0+SIN.W)*STDBT.M-(1-ROW.WE0)*STEQTPOS.M+WTHDRWLS)/STASSETS.M)-
RBAR
4500 E1NUM= ((ROW.WE0+SIN.W-SIN.W*DEL.WE0*(1-ROW.WE0))*(SDBT.C+SLEAPAY.C+SDBT.I+
SDBT.L)-(1-ROW.WE0-DEL.WE0+ROW.WE0*DEL.WE0)*STEQTPOS.M+WTHDRWLS*(1-DEL.WE0*(1-RO
W.WE0)))
4510 E1DEN= (1-DEL.WE0*(1-ROW.WE0))*STASSETS.M
4520 E1=(E1NUM/E1DEN)-RBAR
4540 FOR J=1 TO RIS
4550 REM CALCULATE AA
4560 IF EI(J)>E0 AND EI(J)<E1 THEN GOTO 4570 : ELSE GOTO 4580
4570 AA=STEQTPOS.M+RBAR*(STASSETS.TA-(STASSET.C-MINRATIO.C*STDBT.C))+(STASSET.C-
MINRATIO.C*STDBT.C)*RFRR-SINDBT.T-WTHDRWLS-(SCP.C+SCP.I+SCP.L)+((EI(J)-E1*ROW.WE
0))/(1-ROW.WE0)*(STASSETS.TA-(STASSET.C-MINRATIO.C*STDBT.C))+((REIR*SASSET.L)*(1
-.4*TAXRATE))
4580 REM CALCULATE UE0
4590 IF EI(J)>E0 AND EI(J)<E1 THEN GOTO 4600 : ELSE GOTO 4610
4600 UE0#=UE0#+LAMDA*(RBAR-SIN.W+(EI(J)-E1*ROW.WE0)/(1-ROW.WE0)-((STASSETS.TA)/(
1-ROW.WE0)*(ROW.WE0*AC)))*LN^-(LAMDA*AA):PRINT " HI, HERE I AM IN UE0# !"
4610 REM CALCULATE DED
4620 IF EI(J)>E0 AND EI(J)<E1 THEN DED=DED+(RBAR-SIN.W+(EI(J)-(E1+ROW.WE0)))/(1-
ROW.WE0)
4630 REM CALCULATE AB
4640 IF EI(J) > E1 THEN GOTO 4650 : ELSE GOTO 4660
4650 AB=STEQTPOS.M+(RBAR+EI(J))*(STASSETS.TA-(STASSET.C-MINRATIO.C*STDBT.C))+(ST
ASSET.C-MINRATIO.C*STDBT.C)*RFRR-SINDBT.T-WTHDRWLS+(REIR*SASSET.L)*(1-.4*TAXRATE
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)-(SCP.C+SCP.I+SCP.L):_REM CHECK OUT SCP.C,I,L
4660 REM CALCULATE UE1
4670 IF EI(J)>E1 THEN GOTO 4680 : ELSE GOTO 4690
4680 UE1#=UE1#+LAMDA*(RBAR+EI(J)-SIN.W)*LN^(-LAMDA*AB)
4690 REM CALCULATE DED
4700 IF EI(J)>E1 THEN DED=DED+(RBAR-SIN.W+EI(J))
4710 REM
4720 IF EI(J) < E0 THEN PRBBRY=PRBBRY+1
4750 NEXT J
4770 PRBBRY=PRBBRY/RIS
4780 EU#=(UE0#+UE1#)/RIS
4790 REM ASSIGN SIGN OF EU
4800 IF EU#<0 THEN T=-1:ELSE T=1
4810 RETURN
4820 REM
4830 E0COUNT=0:E1COUNT=0:UAA#=0:UAB#=0
4840 FOR J = 1 TO RIS
4850 IF EI(J) <  E0 THEN GOTO 4940
4860 IF EI(J) => E0 AND EI(J) < E1 THEN E0COUNT=E0COUNT+1
4870 IF EI(J) => E1 THEN E1COUNT=E1COUNT+1
4880 IF EI(J) => E0 AND EI(J) < E1 THEN GOTO 4890:ELSE GOTO 4920
4890 UAAE=TEQTPOS.M+RBAR*(STASSETS.TA-(STASSET.C-MINRATIO.C*STDBT.C))+(STASSET.C
-MINRATIO.C*SDBT.C)*RFRR+(EI(J)-(E1*ROW.WE0))/(1-ROW.WE0)*(STASSETS.TA-(STASSET.
C-MINRATIO.C*STDBT.C))-SINDBT.T-WTHDRWLS+(REIR(CYCLE)*SASSET.L-SASSET.L)*(1-.4*T
AXRATE)
4900 UAA#=UAA#+(-LN^(-LAMDA*UAAE))
4910 GOTO 4940:REM AVIOD UABE & UAB CALCULATION
4920 UABE=TEQTPOS.M+(RBAR+EI(J))*(STASSETS.TA-(STASSET.C-MINRATIO.C*STDBT.C))+(S
TASSET.C-MINRATIO.C*STDBT.C)*RFRR-SINDBT.T-WTHDRWLS+(REIR(CYCLE)*SASSET.L-SASSET
.L)*(1-.4*TAXRATE)
4930 UAB#=UAB#+(-LN^(-LAMDA*UABE))
4940 NEXT J
4950 P0=(1-(E0COUNT+E1COUNT)/RIS):P1=E0COUNT/RIS:P2=E1COUNT/RIS
4960 IF E0COUNT > 0 THEN TUAA#=UAA#/E0COUNT:ELSE TUAA#=0
4970 IF E1COUNT > 0 THEN TUAB#=UAB#/E1COUNT:ELSE TUAB#=0
4980 EUACTUAL#=P0*0+P1*TUAA#+P2*TUAB#
5000 RETURN
5010 REM RENTAL ITERATION
5030 FLAG.TYPE=2:FLAG.EUOPTCHOICE=2
5050 L#=INI.EU#:LDB=INI.DBT:LAP=INI.AP:LS=INI.S:LRBAR=INI.RBAR
5070 U#=REN.EU#:UDB=REN.DBT:UAP=REN.AP:US=REN.S:URBAR=REN.RBAR
5080 REM
5090 X=1
5120 REN.PUR=.5*(ABS(UAP-LAP)):ASSETP=LAP+REN.PUR
5140 IF INT(REN.PUR)<=REN.STOP THEN OPT.EU#=M#:L#=OPT.EU#:OPT.RBAR=M.RBAR:RENASS
ETP.IRA=ASSETP.IRA:RENASSET.LR=ASSET.LR:GOTO 5142:ELSE GOTO 5150
5142 IF ABS(REN.EU#) < ABS(OPT.EU#) THEN ASSET.LR=RASSET.LR:ASSETP.IRA=RASSETP.I
RA:RENASSETP.IRA=RASSETP.IRA:RENASSET.LR=RASSET.LR:RBAR=RRENBAR:REN.RBAR=RBAR:GO
SUB 7510:GOSUB 7710:GOTO 5332:ELSE GOTO 5143
5143 REN.EU#=OPT.EU#:RBAR=OPT.RBAR:RENASSETP.IRA=ASSETP.IRA:RENASSET.LR=ASSET.LR
:GOSUB 7710:GOTO 5332
5150 REM
5160 X=X+1
5200 ASSET.LR=ASSETP/(1+GAMMA1S.I+((.5*RRPA)/PPRA)):ASSETP.IRA=GAMMA1S.I*ASSET.L
R
5230 GOSUB 660
5250 GOSUB 1890
5255 CLS
5260 REM EU(INT)
5270 GOSUB 4370
```

```
5271 LPRINT:LPRINT:LPRINT USING "RENTAL ACREAGE ITERATION FOR GAMMA= ##.### %";(
GAMMA1S.I*100)
5275 LPRINT "INTERMEDIATE EU =";EU#
5276 LPRINT USING "E0= ###.#####      E1= ###.#####      RBAR=###.###%";E0;E1;(R
BAR*100):LPRINT
5277 LPRINT USING "REAL ESTATE= $$######,###    MACHINERY= $$#####,### ";ASSET.L
R;ASSETP.IRA
5278 LPRINT:LPRINT
5280 REM
5290 M#=EU#:MDB=STDBT.M:MAP=ASSETP:MS=T:MRBAR=RBAR
5300 REM
5310 IF LS+MS=0 THEN U#=M#:UDB=MDB:UAP=MAP:US=MS:URBAR=MRBAR:ELSE L#=M#:LDB=MDB:
LAP=MAP:LS=MS:LRBAR=MRBAR
5320 REM
5330 GOTO 5120
5332 REM
5333 GOSUB 4820:OPT.ACT#=EUACTUAL#
5335 REM
5336 IF ABS(INI.EU#) < ABS(REN.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI
.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7500:GOTO 5360:ELSE GOTO 5338
5338 IF ABS(REN.EU#) < ABS(INI.EU#) THEN OPT.EU#=REN.EU#:L#=OPT.EU#:OPT.RBAR=REN
.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHOICE=2:GOSUB 7510:GOTO 5360
5360 REM
5370 GOSUB 5400
5380 REM
5390 GOTO 350
5400 REM
5405 GOSUB 8000
5410 OPT.EU#(IT)=L#
5420 OPT.ACTEU#(IT)=OPT.ACT#
5430 OPT.WRKFLE(IT,1)=FLAG.TYPE
5440 OPT.WRKFLE(IT,2)=GAMMA1S.I
5450 OPT.WRKFLE(IT,3)=ASSET.LR
5460 OPT.WRKFLE(IT,4)=ASSETP.IRA
5470 OPT.WRKFLE(IT,5)=ASSETP.IO
5480 OPT.WRKFLE(IT,6)=ASSETP.LO
5490 OPT.WRKFLE(IT,7)=VOLLIQU.LO
5500 OPT.WRKFLE(IT,8)=VOLLIQU.LR
5510 OPT.WRKFLE(IT,9)=VOLLIQU.I
5520 OPT.WRKFLE(IT,10)=VOLLIQU.IT
5530 OPT.WRKFLE(IT,11)=VOLLIQU.C
5535 OPT.WRKFLE(IT,12)=MAXASSETP.IS
5540 OPT.WRKFLE(IT,13)=OPT.RBAR:PRINT "FLAG.EUOPTCHOICE =";FLAG.EUOPTCHOICE:REM
STOP
5541 ON FLAG.EUOPTCHOICE GOTO 5543,5544,5545,5546
5542 GOTO 5550
5543 FOR I=3 TO 9:OPT.WRKFLE(IT,I)=0:NEXT I:OPT.WRKFLE(IT,11)=0:GOTO 5550
5544 FOR I=5 TO 9:OPT.WRKFLE(IT,I)=0:NEXT I:OPT.WRKFLE(IT,11)=0:GOTO 5550
5545 FOR I=7 TO 9:OPT.WRKFLE(IT,I)=0:NEXT I:OPT.WRKFLE(IT,11)=0:GOTO 5550
5546 FOR I=3 TO 6:OPT.WRKFLE(IT,I)=0:NEXT I:GOTO 5550
5550 RETURN
5560 REM VOLLIQU
5575 LOCATE 20,15:PRINT"Evaluating The Economic Feasibility oF Liquidating Asset
s"
5580 U#=INI.EU#:UDB=INI.DBT:UAP=INI.AP:US=INI.S:U.RBAR=INI.RBAR:UACT#=INI.ACT#:G
OTO 5610
5582 U#=REN.EU#:UDB=REN.DBT:UAP=REN.AP:US=REN.S:U.RBAR=REN.RBAR:UACT#=REN.ACT#:G
OTO 5610
5610 VOLLIQU.T=PVOLLIQU.T*TASSETS.TA
5630 VOLLIQU.LI=VOLLIQU.T/(1+GAMMA1S.I+(PVOLLIQU.LR*(.5*RRPA)/PPRA))
```

```
5640 VOLLIQU.I=VOLLIQU.LI*GAMMA1S.I
5650 IF TAR>0 THEN VOLLIQU.C=(VOLLIQU.LI*PVOLLIQU.LR*(RRPA/PPRA)) : ELSE VOLLIQU
.C=0
5660 IF SASSET.PLR=0 THEN VOLLIQU.LO=VOLLIQU.LI:ELSE VOLLIQU.LO=PVOLLIQU.LO*VOLL
IQU.LI:VOLLIQU.LR=PVOLLIQU.LR*VOLLIQU.LI
5670 ASSETP.IRA=0:ASSET.LR=0:ASSETP.IO=0:ASSETP.LO=0
5690 GOSUB 660
5710 GOSUB 1890
5715 RVOLLIQU.C=0:RVOLLIQU.I=0:RVOLLIQU.LR=0:RVOLLIQU.LO=0:RVOLLIQU.LI=0:RVOLRBA
R=RBAR
5730 GOSUB 4370
5740 REM
5750 VOL.EU#=EU#:VOL.DBT=STDBT.M:VOL.VL=VOLLIQU.T:VOL.S=T:VOL.RBAR=RBAR:
5754 VOLVOLLIQU.LO=VOLLIQU.LO:VOLVOLLIQU.LR=VOLLIQU.LR:VOLVOLLIQU.I=VOLLIQU.I:VO
LVOLLIQU.IT=VOLLIQU.IT:VOLVOLLIQU.C=VOLLIQU.C:VOLMAXAS.IS=MAXASSETP.IS
5756 GOSUB 4820:VOL.ACT#=EUACTUAL#
5757 RVOLLIQU.C=VOLLIQU.C:RVOLLIQU.I=VOLLIQU.I:RVOLLIQU.LR=VOLLIQU.LR:RVOLLIQU.L
O=VOLLIQU.LO:RVOLLIQU.LI=VOLLIQU.LI:RVOLMAXAS.IS=MAXASSETP.IS
5758 GOSUB 7600
5830 REM
5840 IF VOL.S > 0 THEN GOTO 5930
5850 REM
5865 FLAG.TYPE=1
5867 IF START.FLAG=3 AND ABS(INI.EU#) < ABS(VOL.EU#) THEN OPT.EU#=INI.EU#:L#=OPT
.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7500:GOTO 5890
:ELSE GOTO 5868
5868 IF START.FLAG=3 AND ABS(VOL.EU#) < ABS(INI.EU#) THEN OPT.EU#=VOL.EU#:L#=OPT
.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7530:GOTO 5890
:ELSE GOTO 5869
5869 IF START.FLAG=4 AND ABS(PUR.EU#) < ABS(VOL.EU#) THEN OPT.EU#=PUR.EU#:L#=OPT
.EU#:OPT.RBAR=PUR.RBAR:OPT.ACT#=PUR.ACT#:FLAG.EUOPTCHOICE=3:GOSUB 7520:GOTO 5890
:ELSE GOTO 5870
5870 IF START.FLAG=4 AND ABS(VOL.EU#) < ABS(PUR.EU#) THEN OPT.EU#=VOL.EU#:L#=OPT
.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7530:GOTO 5890
5874 IF START.FLAG=0 AND ABS(VOL.EU#) < ABS(INI.EU#) THEN  OPT.EU#=VOL.EU#:L#=OP
T.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7530:GOTO 589
0:ELSE GOTO 5876
5876 IF START.FLAG=0 AND ABS(INI.EU#) < ABS(VOL.EU#) THEN OPT.EU#=INI.EU#:L#=OPT
.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7500:GOTO 5890
:ELSE 5881
5881 IF START.FLAG=1 AND ABS(VOL.EU#) < ABS(INI.EU#) THEN OPT.EU#=VOL.EU#:L#=OPT
.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7530:GOTO 5890
:ELSE GOTO 5883
5883 IF START.FLAG=1 AND ABS(INI.EU#) < ABS(VOL.EU#) THEN OPT.EU#=INI.EU#:L#=OPT
.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7500:GOTO 5890
:ELSE GOTO 5885
5885 IF START.FLAG=2 AND ABS(REN.EU#) < ABS(VOL.EU#) THEN OPT.EU#=REN.EU#:L#=OPT
.EU#:OPT.RBAR=REN.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHOICE=2:GOSUB 7510:GOTO 5890
:ELSE GOTO 5887
5887 IF START.FLAG=2 AND ABS(VOL.EU#) < ABS(REN.EU#) THEN OPT.EU#=VOL.EU#:L#=OPT
.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCHOICE=4:GOSUB 7530:GOTO 5890
5890 REM
5900 GOSUB 5400
5920 GOTO 350
5930 REM (-),(-),(+)
5950 FLAG.TYPE=2
5970 FOR VOL.PCT = VOLPCT TO PVOLLIQU.T STEP VOLPCT
5980 VOLLIQU.T=VOL.PCT*TASSETS.TA
6000 VOLLIQU.LI=VOLLIQU.T/(1+GAMMA1S.I+(PVOLLIQU.LR*(.5*RRPA/PPRA)))
6010 VOLLIQU.I=VOLLIQU.LI*GAMMA1S.I
```

```
6020 VOLLIQU.C=(VOLLIQU.LI*PVOLLIQU.LR*(RRPA/PPRA))
6030 IF SASSET.PLR=0 THEN VOLLIQU.LO=VOLLIQU.LI:ELSE VOLLIQU.LO=PVOLLIQU.LO*VOLL
IQU.LI:VOLLIQU.LR=PVOLLIQU.LR*VOLLIQU.LI
6050 GOSUB 660
6070 GOSUB 1890
6090 GOSUB 4370
6110 M#=EU#:MDB=STDBT.M:MVL=VOLLIQU.T:MS=T:M.RBAR=RBAR
6115 LPRINT
6116 LPRINT:LPRINT USING"LIQUIDATION ITERATION FOR GAMMA= ##.### %";(GAMMA1S.I*1
00)
6117 LPRINT "LIQUIDATION INTERMED.EU =";EU#
6118 LPRINT USING "E0= ###.#####      E1= ###.#####      RBAR=###.###%";E0;E1;(R
BAR*100):LPRINT:LPRINT:LPRINT
6120 REM TEST FOR A SIGN CHANGE
6130 IF VOL.S < > MS THEN OPT.EU#=M#:L#=OPT.EU#:OPT.RBAR=M.RBAR:GOTO 6135
6132 IF ABS(VOL.EU#) < ABS(OPT.EU#) THEN VOLLIQU.C=RVOLLIQU.C:VOLLIQU.I=RVOLLIQU
.I:VOLLIQU.LR=RVOLLIQU.LR:VOLLIQU.LO=RVOLLIQU.LO:VOLMAXAS.IS=RVOLMAXAS.IS:VOLLIQ
U.LI=RVOLLIQU.LI:RBAR=RVOLRBAR:GOSUB 7600:GOTO 6137:ELSE GOTO 6134
6133 VOL.EU#=OPT.EU#:RBAR=OPT.RBAR:VOLVOLLIQU.C=VOLLIQU.C:VOLVOLLIQU.I=VOLLIQU.I
VOLVOLLIQU.LR=VOLLIQU.LR:VOLVOLLIQU.LO=VOLLIQU.LO:VOLMAXAS.IS=MAXASSETP.IS:VOLVO
LLIQU.LI=VOLLIQU.LI:GOSUB 7600:GOTO 6135
6134 NEXT VOL.PCT
6135 REM CAL ACT. EU
6137 GOSUB 4820:OPT.ACT#=EUACTUAL#
6138 VOL.EU#=OPT.EU#:L#=OPT.EU#:VOL.RBAR=OPT.RBAR:VOL.ACT#=OPT.ACT#
6140 IF ABS(INI.EU#) < ABS(VOL.EU#) AND RAL=0 THEN GOTO 6144:ELSE GOTO 6141
6141 IF ABS(VOL.EU#) < ABS(INI.EU#) AND RAL=0 THEN GOTO 6145:ELSE GOTO 6142
6142 IF ABS(INI.EU#) < ABS(REN.EU#) AND ABS(INI.EU#) < ABS(VOL.EU#) THEN GOTO 61
44:ELSE GOTO 6143
6143 IF ABS(REN.EU#) < ABS(INI.EU#) AND ABS(REN.EU#) < ABS(VOL.EU#) THEN GOTO 61
46
6144 OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCH
OICE=1:GOSUB 7500:GOSUB 7900:GOTO 6170
6145 OPT.EU#=VOL.EU#:L#=OPT.EU#:OPT.RBAR=VOL.RBAR:OPT.ACT#=VOL.ACT#:FLAG.EUOPTCH
OICE=4:VOLVOLLIQU.LI=VOLLIQU.LI:VOLVOLLIQU.I=VOLLIQU.I:VOLVOLLIQU.C=VOLLIQU.C:VO
LVOLLIQU.LO=VOLLIQU.LO:GOSUB 7530:GOSUB 7600:GOTO 6170
6146 OPT.EU#=REN.EU#:L#=OPT.EU#:OPT.RBAR=REN.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCH
OICE=2:GOSUB 7510:GOSUB 7710:GOTO 6170
6170 REM TEMP WORKFILE
6180 GOSUB 5400
6200 GOTO 350
6210 REM (+,+,+)
6230 FLAG.TYPE=1
6235 REM CAL EU ACTUAL
6236 GOSUB 4820
6240 IF ABS(INI.EU#) < ABS(REN.EU#) AND ABS(INI.EU#)<ABS(PUR.EU#) THEN OPT.EU#=I
NI.EU#:L#=OPT.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7
500:GOTO 6270:ELSE GOTO 6250
6250 IF ABS(REN.EU#) < ABS(INI.EU#) AND ABS(REN.EU#)<ABS(PUR.EU#) THEN OPT.EU#=R
EN.EU#:L#=OPT.EU#:OPT.RBAR=REN.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHOICE=2:GOSUB 7
510:GOTO 6270:ELSE GOTO 6260
6260 IF ABS(PUR.EU#) < ABS(INI.EU#) AND ABS(PUR.EU#)<ABS(REN.EU#) THEN OPT.EU#=P
UR.EU#:L#=OPT.EU#:OPT.RBAR=PUR.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHOICE=3:PURASSE
T.LR=RENASSET.LR:PURASSETP.IRA=RENASSETP.IRA:GOSUB 7520
6270 REM
6280 GOSUB 5400
6300 GOTO 350
6310 REM (+,NA,+)
6330 FLAG.TYPE=1
6340 IF ABS(INI.EU#) < ABS(PUR.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI
```

```
.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7500:GOTO 6360:ELSE GOTO 6342
6342 IF ABS(PUR.EU#) < ABS(INI.EU#) THEN OPT.EU#=PUR.EU#:L#=OPT.EU#:OPT.RBAR=PUR
.RBAR:OPT.ACT#=PUR.ACT#:FLAG.EUOPTCHOICE=3:GOSUB 7520
6360 GOTO 6270
6370 REM PUR ITERATION
6390 FLAG.TYPE=2:FLAG.EUOPTCHOICE=3
6410 IF RAL=0 THEN L#=INI.EU#:LDB=INI.DBT:LAP=INI.AP:LS=INI.S:L.RBAR=INI.RBAR:U#
=PUR.EU#:UDB=PUR.DBT:UAP=PUR.AP:US=PUR.S:U.RBAR=PUR.RBAR
6430 IF RAL < > 0 THEN L#=REN.EU#:LDB=REN.DBT:LAP=REN.AP:LS=REN.S:L.RBAR=REN.RBA
R:U#=PUR.EU#:UDB=PUR.DBT:UAP=PUR.AP+REN.AP:US=PUR.S:U.RBAR=PUR.RBAR
6460 X=1
6500 PUR.PUR=.5*(ABS(UAP-LAP)):ASSETP=LAP+PUR.PUR
6560 IF INT(PUR.PUR)<=PUR.STOP THEN OPT.EU#=M#:L#=OPT.EU#:OPT.RBAR=M.RBAR:PURASS
ETP.LO=ASSETP.LO:PURASSETP.IO=ASSETP.IO:GOTO 6565:ELSE GOTO 6620
6565 IF ABS(PUR.EU#)<ABS(OPT.EU#) THEN ASSETP.LO=RASSETP.LO:ASSETP.IO=RASSETP.IO
:RBAR=RPURBAR:PURASSETP.IO=RASSETP.IO:PURASSETP.LO=RASSETP.LO:GOSUB 7800:GOTO 67
70:ELSE PUR.EU#=OPT.EU#:RBAR=OPT.RBAR:PURASSETP.IO=ASSETP.IO:PURASSETP.LO=ASSETP
.LO:GOTO 6566
6566 GOSUB 7800:GOTO 6770
6620 ASSETP.LO=(ASSETP-ASSET.LR)/(1+GAMMA1S.I):ASSETP.IO=GAMMA1S.I*ASSETP.LO
6640 GOSUB 660
6660 GOSUB 1890
6670 REM EU(INT)
6680 GOSUB 4370
6700 M#=EU#:MDB=STDBT.M:MAP=ASSETP:MS=T:M.RBAR=RBAR
6720 LPRINT
6724 LPRINT:LPRINT USING"REAL ESTATE PURCHASE ITERATION FOR GAMMA= ##.### %";(GA
MMA1S.I*100)
6725 LPRINT "R/E PURCHASE INTERMEDIATE EU =";EU#
6726 LPRINT USING "E0= ###.#####      E1= ###.#####      RBAR=###.###%";E0;E1;(R
BAR*100):LPRINT
6727 LPRINT USING "REAL ESTATE= $$######,###    MACHINERY= $$#####,### ";ASSETP.
LO;ASSETP.IO
6728 LPRINT:LPRINT
6730 IF LS+MS=0 THEN U#=M#:UDB=MDB:UAP=MAP:US=MS:U.RBAR=M.RBAR:ELSE L#=M#:LDB=MD
B:LAP=MAP:LS=MS:L.RBAR=M.RBAR
6740 REM
6750 GOTO 6500
6760 REM CAL EU ACTUAL
6770 GOSUB 4820:OPT.ACT#=EUACTUAL#
6772 IF RAL=0 AND ABS(INI.EU#) < ABS(PUR.EU#) THEN OPT.EU#=INI.EU#:L#=OPT.EU#:OP
T.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHOICE=1:GOSUB 7500:GOTO 6790:ELSE G
OTO 6774
6774 IF RAL=0 AND ABS(PUR.EU#) < ABS(INI.EU#) THEN OPT.EU#=PUR.EU#:L#=OPT.EU#:OP
T.RBAR=RBAR:OPT.ACT#=PUR.ACT#:FLAG.EUOPTCHOICE=3:GOSUB 7520:GOTO 6790:ELSE GOTO
6776
6776 IF RAL <> 0 AND ABS(REN.EU#) < ABS(INI.EU#) AND ABS(REN.EU#)<ABS(PUR.EU#) T
HEN OPT.EU#=REN.EU#:L#=OPT.EU#:OPT.RBAR=REN.RBAR:OPT.ACT#=REN.ACT#:FLAG.EUOPTCHO
ICE=2:GOSUB 7510:GOTO 6790:ELSE GOTO 6778
6778 IF RAL <> 0 AND ABS(INI.EU#) < ABS(REN.EU#) AND ABS(INI.EU#)<ABS(PUR.EU#) T
HEN OPT.EU#=INI.EU#:L#=OPT.EU#:OPT.RBAR=INI.RBAR:OPT.ACT#=INI.ACT#:FLAG.EUOPTCHO
ICE=1:GOSUB 7500:GOTO 6790:ELSE GOTO 6780
6780 IF RAL <> 0 AND ABS(PUR.EU#) < ABS(INI.EU#) AND ABS(PUR.EU#)<ABS(REN.EU#) T
HEN OPT.EU#=PUR.EU#:L#=OPT.EU#:OPT.RBAR=PUR.RBAR:OPT.ACT#=PUR.ACT#:FLAG.EUOPTCHO
ICE=3:GOSUB 7520
6785 REM TEMP WORKFILE
6790 GOSUB 5400
6810 GOTO 350
7345 CLS:LOCATE 9,27:PRINT " Model Now Loading Module No. 4a"
7350 CHAIN "MOD4A",,ALL
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7500 ASSET.LR=INIASSET.LR:ASSETP.IRA=INIASSETP.IRA:ASSETP.IO=INIASSETP.IO:ASSETP
.LO=INIASSETP.LO:VOLLIQU.IT=INIVOLLIQU.IT:MAXASSETP.IS=INIMAXAS.IS:VOLLIQU.C=0:V
OLLIQU.I=0:VOLLIQU.LR=0:VOLLIQU.LO=0:RETURN
7510 ASSET.LR=RENASSET.LR:ASSETP.IRA=RENASSETP.IRA:ASSETP.IO=RENASSETP.IO:ASSETP
.LO=RENASSETP.LO:VOLLIQU.IT=RENVOLLIQU.IT:MAXASSETP.IS=RENMAXAS.IS:VOLLIQU.C=0:V
OLLIQU.LO=0:VOLLIQU.LR=0:VOLLIQU.I=0:RETURN
7520 ASSET.LR=PURASSET.LR:ASSETP.IRA=PURASSETP.IRA:ASSETP.IO=PURASSETP.IO:ASSETP
.LO=PURASSETP.LO:VOLLIQU.IT=PURVOLLIQU.IT:MAXASSETP.IS=PURMAXAS.IS:VOLLIQU.I=0:V
OLLIU.LR=0:VOLLIQU.C=0:VOLLIQU.LO=0:RETURN
7530 ASSET.LR=0:ASSETP.IRA=0:ASSETP.IO=0:ASSETP.LO=0:VOLLIQU.IT=VOLVOLLIQU.IT:MA
XASSETP.IS=VOLMAXAS.IS:VOLLIQU.I=VOLVOLLIQU.I:VOLLIU.LR=VOLVOLLIQU.LR:VOLLIQU.C=
VOLVOLLIQU.C:VOLLIQU.LO=VOLVOLLIQU.LO:RETURN
7600 REM LIQUIDATION
7602 LPRINT
7605 LPRINT:LPRINT"LIQUIDATION EXPECTED UTILITY CALCULATION FOR GAMMA= ";(GAMMA1
S.I*100)
7610 LPRINT"LIQUIDATION EXPECTED UTILITY= ";VOL.EU#
7620 LPRINT USING "E0= ###.#####      E1= ###.#####       RBAR=###.##%";E0;E1;(R
BAR*100)
7630 LPRINT "VOL.EUACTUAL = ";EUACTUAL#
7640 LPRINT USING"  OWNED REAL ESTATE SOLD= $$######,###  No. OF ACRES= ####,###
";VOLLIQU.LO;(VOLLIQU.LO/PPPA)
7650 LPRINT USING" RENTAL ACREAGE RELEASED= $$######,###  No. OF ACRES= ####,###
";VOLLIQU.LR;(VOLLIQU.LR/PPRA)
7655 LPRINT USING"  TOTAL ACREAGE RELEASED= $$######,###   TOTAL ACRES= ####,###
";(VOLLIQU.LO+VOLLIQU.LR);((VOLLIQU.LR/PPRA)+(VOLLIQU.LO/PPPA))
7660 LPRINT USING "          MACHINERY SOLD= $$######,### ";VOLLIQU.I
7670 LPRINT USING " PREPAID LEASE FORFEITED= $$######,###";VOLLIQU.C
7680 LPRINT USING "       TOTAL ASSETS SOLD= $$######,###  LIQUID. COST= $$#####
#,###";VOLLIQU.T;(VOLLIQU.C+VOLLIQU.I*ROW.I+VOLLIQU.LO*ROW.L)
7690 LPRINT USING "MACHINERY ADJUSTMENT FOR GAMMA: SALE= $$######,###  PURCHASE=
 $$######,###";VOLLIQU.IT;MAXASSETP.IS
7700 RETURN
7710 REM RENTAL
7715 LPRINT
7720 LPRINT:LPRINT"RENTAL EXPECTED UTILITY CALCULATION FOR GAMMA=";GAMMA1S.I
7730 LPRINT"EU(MAX RENTAL)= ";REN.EU#
7740 LPRINT USING "E0= ###.#####      E1= ###.#####       RBAR=###.##%";E0;E1;(R
BAR*100)
7750 LPRINT "RENTAL EU ACTUAL = ";EUACTUAL#
7760 LPRINT"No. OF ACRES =";INT(ASSET.LR/PPRA)
7765 LPRINT USING"     VALUE OF RENTAL LAND: $$######,###  MACHINERY:$$######,##
#";INT(ASSET.LR);INT(ASSETP.IRA)
7770 LPRINT USING"           CASH REQUIRED: $$######,### TOTAL DEBT:$$######,##
#";INT(ASSETP.IRA*CASHDP.I);INT(ASSETP.IRA*(1-CASHDP.I))
7780 LPRINT USING"MACHINERY FOR GAMMA- SALE: $$######,###   PURCHASE:$$######,##
#";INT(VOLLIQU.IT);INT(MAXASSETP.IS)
7790 LPRINT:RETURN
7800 REM PUR
7805 LPRINT
7810 LPRINT:LPRINT" PURCHASE EXPECTED UTILITY CALCULATION FOR GAMMA= ";(GAMMA1S.
I*100)
7820 LPRINT "PURCHASE EXPECTED UTILITY= ";PUR.EU#
7830 LPRINT"E0= ";E0,"E1= ";E1,"RBAR= ";(RBAR*100)
7840 LPRINT "PURCHASE EU ACTUAL= ";EUACTUAL#
7850 LPRINT USING" No. OF ACRES= ####,###  VALUE OF PURCHASED LAND= $$######,###
";INT(ASSETP.LO/PPPA);ASSETP.LO
7860 LPRINT USING" MACHINERY REQUIRED= $$######,###   CASH REQUIRED= $$######,##
#";ASSETP.IO;(ASSETP.IO*CASHDP.I+ASSETP.LO*CASHDP.L)
7870 LPRINT USING"TOTAL DEBT= $$######,###   TOTAL ASSETS PURCHASED= $$######,##
```

```
#";(ASSETP.LO*(1-CASHDP.L)+ASSETP.IO*(1-CASHDP.I));(ASSETP.IO+ASSETP.LO)
7880 LPRINT USING "MACHINERY ADJUSTMENT FOR GAMMA: SALE= $$######,###  PURCHASE=
 $$######,###";VOLLIQU.IT;MAXASSETP.IS
7890 LPRINT:RETURN
7900 LPRINT
7910 LPRINT:LPRINT" INITIAL EXPECTED UTILITY CALCULATION FOR GAMMA= ";GAMMA1S.I
7920 LPRINT "INITIAL EXPECTED UTILITY= ";INI.EU#
7930 LPRINT USING "E0= ###.#####      E1= ###.#####       RBAR=###.###%";E0;E1;(I
NI.RBAR*100)
7940 LPRINT "INI.EU ACTUAL = ";EUACTUAL#
7950 LPRINT USING "MACHINERY ADJUSTMENT FOR GAMMA: SALE= $$######,###  PURCHASE=
 $$######,###";INT(VOLLIQU.IT);INT(MAXASSETP.IS)
7960 RETURN
8000 LPRINT:LPRINT "- - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - -";:LPRINT
8002 LPRINT USING" CORN: EXPECTED= $$###.##  RANDOM PRICE= $$###.##  RANDOM YIEL
D= ###";EPC;STOPC;STOYC
8010 LPRINT USING" SOYBEANS: EXPECTED= $$###.## RANDOM PRICE= $$###.##  RANDOM Y
IELD= ###";EPS;STOPS;STOYS
8020 LPRINT USING"TREND YIELDS: CORN= ###  SOYBEANS= ###";TYLDC;TYLDS
8023 LPRINT USING"GROSS MARGIN/ACRE: CORN = $$###.##   SOYBEANS = $$###.##";GMCP
A;GMSPA
8025 LPRINT
8026 LPRINT "- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 - - - -";:LPRINT
8030 RETURN
```

```
10 REM ***************                MODULE 4A          ***************
20 REM ***************  DATE LAST UPDATED 11/28/88  ***************
30 REM ***************  DATE LAST PRINTED 12/02/88  ***************
40 REM ***************  TIME LAST PRINTED 04:45 PM  ***************
45 REM  $INCLUDE: 'MODCOM'
50 REM  170   :REM TEST FOR ITERATION COUNTER
60 REM  340   :REM OPTIMAL CHOICE DISPLAY
70 REM  510   :REM OPTIMAL DEBT STRUCTURE/ASSET PURCHASE
80 REM  700   :REM OPTIMAL DEBT STRUCTURE/ASSET LIQUIDATION
90 REM  860   :REM ASSET PURCHASE SELECTION SCREEN
100 REM 1005   :REM ASSET LIQUIDATION SELECTION SCREEN
110 REM 1160   :REM DEBT PREPAYMENT OPTION
120 REM 1700   :REM BALANCE SHEET UPDATE ROUTINE
130 REM 2220   :REM CHAIN MOD No. 6A
140 REM 2230   :REM BALANCE SHEET EQUATIONS
145 REM 3480   :REM BANKRUPTCY ROUTINE
150 REM 3520   :REM S-BALANCE SHEET FORMAT
230 REM SELECT THE SMALLEST EU
240 SMALLEST#=999
250 FOR TEST=1 TO IT
260 IF ABS(OPT.EU#(TEST)) < ABS(SMALLEST#) THEN SMALLEST#=OPT.EU#(TEST):SMALLEST
=TEST:OPT.CHOICE=SMALLEST
270 NEXT TEST
280 GOTO 340: REM OPTIMAL CHOICE DISPLAY
290 REM SELECT THE LARGEST ACTUAL EU
300 LARGEST#=OPT.ACTEU#(1)
310 FOR TEST=1 TO IT
320 IF OPT.ACTEU#(TEST) => LARGEST# THEN LARGEST#=OPT.ACTEU#(TEST):LARGEST=TEST:
OPT.CHOICE=LARGEST
330 NEXT TEST
340 REM OPTIMAL CHOICE DISPLAY
350 REM ASSIGN OPT.GAMMA RELATIONSHIPS TO VARIABLES
360 GAMMA1S.I=OPT.WRKFLE(OPT.CHOICE,2)
370 ASSET.LR=OPT.WRKFLE(OPT.CHOICE,3)
380 ASSETP.IRA=OPT.WRKFLE(OPT.CHOICE,4)
390 ASSETP.IO=OPT.WRKFLE(OPT.CHOICE,5)
400 ASSETP.LO=OPT.WRKFLE(OPT.CHOICE,6)
410 VOLLIQU.LO=OPT.WRKFLE(OPT.CHOICE,7)
420 VOLLIQU.LR=OPT.WRKFLE(OPT.CHOICE,8)
430 VOLLIQU.I=OPT.WRKFLE(OPT.CHOICE,9)
440 VOLLIQU.IT=OPT.WRKFLE(OPT.CHOICE,10)
450 VOLLIQU.C=OPT.WRKFLE(OPT.CHOICE,11)
460 MAXASSETP.IS=OPT.WRKFLE(OPT.CHOICE,12)
465 RBAR=OPT.WRKFLE(OPT.CHOICE,13)
467 REM GOSUB ROUTINE FOR ADJUSTING ASSET PURCHASES AND LIQUIDATIONS TO MINIMIZE
 TRANSACTION COSTS
469 IVOLLIQU.IT=ABS(VOLLIQU.IT)
470 REM RUN THROUGH THE S-BALANCE SHEET TO SET UP OPTIMUM BALANCE SHEET
475 FLAG.DECISION=4
480 GOSUB 2290
490 REM TEST FOR ASSETP OR VOLLIQU DECISION
495 IF ASSET.LR > 0 OR ASSETP.LO > 0 THEN 510
500 IF STDBT.CB > TDBT.CB THEN 510:ELSE GOTO 700
510 STOP:CLS
520 PRINT TAB(11);:COLOR 15:PRINT "Firm's Optimal Debt Structure and Asset Purch
ases : ";YEAR:COLOR 7:PRINT
530 PRINT TAB(15);"Firm's Optimal Total Debt      : "; USING "$$######,###";INT(
STDBT.CB):PRINT
```

```
540 PRINT TAB(15);"Firm's Current Debt Position    : "; USING "$$######,###";INT(
TDBT.CB):PRINT
550 PRINT TAB(15);"Recommended Change in Debt      : "; USING "$$######,###";INT(
STDBT.CB-TDBT.CB)
560 PRINT TAB(11);:COLOR 15:PRINT "Based On The Input Parameters, To Maximize Th
e After Tax Equity Position Of The Firm Lease And/Or Purchase The Following Addi
tional Assets ... ":COLOR 7:PRINT
570 PRINT "Catagory";TAB(20);"Lease/Purchase Price";TAB(47);"Cash Required";TAB(
66);"Debt Required":PRINT
580 PRINT "Cash Leased Land";:LOCATE CSRLIN,28:PRINT USING "$$######,###";ASSET.
LR;:LOCATE CSRLIN,61:COLOR 15:PRINT"*";:COLOR 7:LOCATE CSRLIN,48:PRINT USING "$$
######,###";(ASSET.LR/PPRA)*RRPA*.5;
590 LOCATE CSRLIN,67:PRINT USING"$$######,###";(ASSET.LR/PPRA)*RRPA
600 PRINT:PRINT "Purchase Land";:LOCATE CSRLIN,28:PRINT USING "$$######,###";ASS
ETP.LO;:LOCATE CSRLIN,48:PRINT USING "$$######,###";(ASSETP.LO*CASHDP.L);:LOCATE
 CSRLIN,67: PRINT USING "$$######,###";(ASSETP.LO*(1-CASHDP.L))
610 TOTME=ASSETP.IO+ASSETP.IRA+MAXASSETP.IS-IVOLLIQU.IT
615 IF (IVOLLIQU.IT+VOLLIQU.I)>(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) THEN MECDP=0:
ELSE MECDP=(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-IVOLLIQU.IT-VOLLIQU.I)*CASHDP.I
619 PRINT:PRINT "Machinery";:LOCATE CSRLIN,28:PRINT USING "$$######,###";TOTME;:
LOCATE CSRLIN,48:PRINT USING "$$######,###";MECDP;
620 IF SNETVOLL.I=0 AND (IVOLLIQU.IT+VOLLIQU.I)>(ASSETP.IO+ASSETP.IRA+MAXASSETP.
IS) THEN RDBT.I=((-IVOLLIQU.IT-VOLLIQU.I)*(1-ROW.I)+(ASSETP.IRA+ASSETP.IO+MAXASS
ETP.IS)*(1-CASHDP.I)) ELSE GOTO 621
621 IF SNETVOLL.I=0 AND (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)>(IVOLLIQU.IT+VOLLIQU
.I) THEN RDBT.I=((ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)*(1-CASHDP.I)-(IVOLLIQU.IT+V
OLLIQU.I)*(1-ROW.I)):ELSE GOTO 622
622 IF SNETVOLL.I>0 THEN RDBT.I=0
623 LOCATE CSRLIN,67:PRINT USING"$$######,###";RDBT.I;
625 REM LOCATE CSRLIN,67:PRINT USING"$$######,###";((ASSETP.IO+ASSETP.IRA+MAXASS
ETP.IS)*(1-CASHDP.I)-VOLLIQU.IT*(1-ROW.I));
626 REM IF (ASSETP.IO+ASSETP.IRA+MAXASSETP.IS-VOLLIQU.IT) >0 THEN TOTCDP=((ASSET
P.IO+ASSETP.IRA+MAXASSETP.IS-VOLLIQU.IT)*CASHDP.I+ASSETP.LO*CASHDP.L):ELSE TOTCD
P=ASSETP.LO*CASHDP.L
627 TOTCDP=MECDP+ASSETP.LO*CASHDP.L
630 PRINT:PRINT:PRINT "Totals";:LOCATE CSRLIN,28:PRINT USING "$$######,###";TOTM
E+ASSET.LR+ASSETP.LO;:LOCATE CSRLIN,48:PRINT USING "$$######,###";TOTCDP;
640 LOCATE CSRLIN,67: PRINT USING "$$######,###";(RDBT.I+ASSETP.LO*(1-CASHDP.L)+
((ASSET.LR/PPRA)*RRPA));
650 PRINT TAB(4);:COLOR 15:PRINT "* ";:COLOR 7:PRINT"Note : Cash Payment For Lea
sed Land Comes From Operating Line Of Credit";
655 IF TOTME < 0 THEN PRINT TAB(14);"Negative Machinery Purchase Indicates A Red
uction From Current Inventory Level"
660 LOCATE 24,27:PRINT"Press  < C >  to Continue  ";
670 IF INKEY$ = "" THEN 670:ELSE LOCATE 24,27:PRINT "
 ";
680 FOR I=1 TO 8:FOR J= 1 TO 50:NEXT J:LOCATE 24,27:PRINT:SOUND 400,4:SOUND 3276
7,0:FOR J= 1 TO 50:NEXT J:NEXT I
690 GOTO 860
700 CLS:REM LIQUIDATION DECISION
710 PRINT TAB(10);:COLOR 15:PRINT "Firm's Optimal Debt Structure and Asset Liqui
dation : ";YEAR:COLOR 7:PRINT
720 PRINT TAB(15);"Firm's Optimal Total Debt       : "; USING "$$######,###.##";I
NT(STDBT.CB):PRINT
730 PRINT TAB(15);"Firm's Current Debt Position    : "; USING "$$######,###.##";I
NT(TDBT.CB):PRINT
740 PRINT TAB(16);"Recommend Prepaying this Debt : "; USING "$$######,###.##";IN
T(TDBT.CB-STDBT.CB)
750 PRINT TAB(11);:COLOR 15:PRINT"Based On The Input Parameters, The Firm Has Ex
ceeded It's Optimal Debt Position And Should Liquidate Assets And Prepay Debt As
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 Indicated ... ":COLOR 7:PRINT
760 PRINT "Catagory";TAB(21);"Amount to Liquidate";TAB(44);"Liquidation Cost";TA
B(64);"Debt Reduction":PRINT
770 PRINT "Cash Leased Land";:LOCATE CSRLIN,28:PRINT USING "$$######,###";VOLLIQ
U.LR;:LOCATE CSRLIN,48:PRINT USING "$$######,###";VOLLIQU.C;:LOCATE CSRLIN,66: P
RINT USING "$$######,###";VOLLIQU.C*.5
772 IF SNETVOLL.L=0 AND (VOLLIQU.LO*(1-ROW.L))<(DBT.L) THEN RDBT.L=(VOLLIQU.LO*(
1-ROW.L)):ELSE GOTO 773
773 IF SNETVOLL.L>0 AND (VOLLIQU.LO*(1-ROW.L))>(DBT.L) THEN RDBT.L=DBT.L
779 PRINT:PRINT "Owned Land";:LOCATE CSRLIN,28:PRINT USING "$$######,###";VOLLIQ
U.LO;:LOCATE CSRLIN,48:PRINT USING "$$######,###";VOLLIQU.LO*ROW.L;:LOCATE CSRLI
N,66: PRINT USING "$$######,###";RDBT.L
780 REM PRINT:PRINT "Owned Land";:LOCATE CSRLIN,28:PRINT USING "$$######,###";VO
LLIQU.LO;:LOCATE CSRLIN,48:PRINT USING "$$######,###";VOLLIQU.LO*ROW.L;:LOCATE C
SRLIN,66: PRINT USING "$$######,###";VOLLIQU.LO-(VOLLIQU.LO*ROW.L)
781 IF FLAG.DECISION=0 AND (IVOLLIQU.IT +MAXASSETP.IS)=0 THEN RDBT.I=0:GOTO 786:
ELSE GOTO 782
782 IF SNETVOLL.I=0 AND (IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO)>(MAXASSETP.IS) THEN R
DBT.I=(+IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO)*(1-ROW.I)-(MAXASSETP.IS)*(1-CASHDP.I):
GOTO 788:ELSE GOTO 783
783 IF SNETVOLL.I=0 AND MAXASSETP.IS > (IVOLLIQU.IT+VOLLIQU.IO+VOLLIQU.I) THEN R
DBT.I=-MAXASSETP.IS*(1-CASHDP.I)+(IVOLLIQU.IT-VOLLIQU.I-VOLLIQU.IO)*(1-ROW.I):EL
SE GOTO 784
784 IF SNETVOLL.I>0 THEN RDBT.I=DBT.I
786 TOTME=-MAXASSETP.IS+IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO
787 REM IF (IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO)>(ASSETP.IRA+MAXASSETP.IS) THEN MEC
DP=0:ELSE MECDP=(ASSETP.IRA+MAXASSETP.IS-IVOLLIQU.IT-VOLLIQU.I-VOLLIQU.IO)*CASHD
P.I
788 IF MAXASETP.IS > (IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO) THEN MELIQCT=0:GOTO 789:
ELSE MELIQCT=(IVOLLIQU.IT+VOLLIQU.I+VOLLIQU.IO-MAXASSETP.IS)*ROW.I
789 PRINT:PRINT "Machinery";:LOCATE CSRLIN,28:PRINT USING "$$######,###";TOTME;:
LOCATE CSRLIN,48:PRINT USING "$$######,###";MELIQCT;
790 REM PRINT:PRINT "Machinery";:LOCATE CSRLIN,28:PRINT USING "$$######,###";VOL
LIQU.I+VOLLIQU.IT;:LOCATE CSRLIN,48:PRINT USING "$$######,###";(VOLLIQU.IT+VOLLI
QU.I)*ROW.I;
791 LOCATE CSRLIN,66: PRINT USING "$$######,###";RDBT.I;
800 REM PRINT:PRINT:PRINT "Totals";:LOCATE CSRLIN,28:PRINT USING "$$######,###";
(VOLLIQU.LR+VOLLIQU.I+VOLLIQU.IT+VOLLIQU.LO);:LOCATE CSRLIN,48:PRINT USING "$$##
####,###";VOLLIQU.C+(VOLLIQU.I+VOLLIQU.IT)*ROW.I+VOLLIQU.LO*ROW.L;
801 PRINT:PRINT:PRINT "Totals";:LOCATE CSRLIN,28:PRINT USING "$$######,###";(TOT
ME+VOLLIQU.LR+VOLLIQU.LO);:LOCATE CSRLIN,48:PRINT USING "$$######,###";VOLLIQU.C
+MELIQCT+VOLLIQU.LO*ROW.L;
810 REM LOCATE CSRLIN,66: PRINT USING "$$######,###";(VOLLIQU.C)+(VOLLIQU.LO-(VO
LLIQU.LO*ROW.L))+((VOLLIQU.I+VOLLIQU.IT)-((VOLLIQU.I+VOLLIQU.IT)*ROW.I))
811 LOCATE CSRLIN,66: PRINT USING "$$######,###";(VOLLIQU.C+RDBT.I+RDBT.L)
812 IF TOTME < 0 THEN PRINT TAB(14);"Negative Machinery Indicates An Increse Fro
m The Current Inventory Level"
820 LOCATE 24,27:PRINT"Press  < C >  to Continue  ";
829 IF INKEY$ =  "" THEN 829:ELSE LOCATE 24,27:PRINT "
  ";
830 REM IF INKEY$ < > "c"  OR INKEY$ < > "C" THEN 830:ELSE LOCATE 24,27:PRINT "
                          ";
840 FOR I=1 TO 7:FOR J= 1 TO 50:NEXT J:LOCATE 24,27:PRINT:SOUND 400,4:SOUND 3276
7,0:FOR J= 1 TO 50:NEXT J:NEXT I
850 GOTO 1005
860 ZERO=0:REM ASSET PURCHASE SELECTION SCREEN
870 LOCATE 16,1:PRINT TAB(22);"Select Up To The Indicated Amount"
880 PRINT:PRINT TAB(15);"Rental Land                                ";USING "$$######,###
";ZERO
890 PRINT TAB(15);"Purchase Farm Land                       "; USING "$$######,###";ZER
```

```
O
900 PRINT TAB(15);"Machinery                                    "; USING "$$######,###";ZE
O
910 PRINT TAB(15);"Value of Purchased/Leased Assets  "; USING "$$######,###";ZE
O
920 LOCATE 23,23:PRINT"Do You Want To Make A Purchase ? ";
921 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 921:ELSE LOCATE 23,20:PRINT S39$;
925 D=INSTR(DEE$,D$):IF D < 4 THEN FLAG.DECISION=0:GOTO 1160:ELSE FLAG.DECISION=
1:GOTO 960
940 LOCATE 23,1:PRINT S79$;:LOCATE 23,23:PRINT"Do You Want To Make Any Changes ?
 ";
941 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 941:ELSE LOCATE 23,20:PRINT S39$;
945 D=INSTR(DEE$,D$):IF D < 4 THEN ASSETP.LO=XASSETP.LO:ASSET.LR=XASSET.LR:ELSE
LOCATE 23,1:PRINT S79$;:GOTO 960
954 GOTO 1160
955 REM IF XMACH=0 THEN MAXASSETP.IS=0:VOLLIQU.IT=0:GOTO 1160:ELSE GOTO 1160
960 LOCATE 18,61:PRINT S10$;:LOCATE 18,61:INPUT;" => ",A$:IF A$ < > "" THEN XASS
ET.LR=VAL(A$):LOCATE 18,49:PRINT USING "$$######,###";XASSET.LR;:PRINT S10$;:ELS
E LOCATE 18,61:PRINT S10$;
962 LOCATE 19,61:PRINT S10$;:LOCATE 19,61:INPUT;" => ",A$:IF A$ < > "" THEN XASS
ETP.LO=VAL(A$):LOCATE 19,49:PRINT USING "$$######,###";XASSETP.LO;:PRINT S10$;:E
LSE LOCATE 19,61:PRINT S10$;
964 XMACH=INT((.(XASSETP.LO+XASSET.LR)*GAMMA1S.I)+MAXASSETP.IS-IVOLLIQU.IT)
965 IF MAXASSETP.IS > 0 THEN VOLLIQU.IT=0:GOTO 976
966 REM IF (ASSETP.IRA+ASSETP.IO) > 0 AND IVOLLIQU.IT > (ASSETP.IRA+ASSETP.IO) T
HEN GOTO 969
967 REM IF (ASSETP.IRA+ASSETP.IO) > 0 AND IVOLLIQU.IT < (ASSETP.IRA+ASSETP.IO) T
HEN GOTO 970
968 REM IF (ASSETP.IRA+ASSETP.IO)=0 THEN VOLLIQU.IT=IVOLLIQU.IT:IROWCOST=VOLLIQU
.IT*ROW.I:GOTO 976
969 REM VOLLIQU.IT=IVOLLIQU.IT-(ASSETP.IRA+ASSETP.IO):IROWCOST=VOLLIQU.IT*ROW.I:
GOTO 976
970 REM IF ASSETP.IRA>IVOLLIQU.IT THEN  VOLLIQU.IT=0:ASSETP.IRA=ASSETP.IRA-IVOLL
IQU.IT:ASSETP.IO=ASSETP.IO:GOTO 976
971 REM IF IVOLLIQU.IT > ASSETP.IRA AND ASSETP.IO>0 AND ASSETP.IO>(IVOLLIQU.IT-A
SSETP.IRA) THEN ASSETP.IRA=0:ASSETP.IO=ASSETP.IO-(IVOLLIQU.IT-ASSETP.IRA):VOLLIQ
U.IT=0:IROWCOST=0:GOTO 976
972 REM IF IVOLLIQU.IT>ASSETP.IRA AND ASSETP.IO>0 AND ASSETP.IO<(IVOLLIQU.IT-ASS
ETP.IRA) THEN ASSETP.IRA=0:ASSETP.IO=0:VOLLIQU.IT=IVOLLIQU.IT-ASSETP.IRA-ASSETP.
IO:IROWCOST=VOLLIQU.IT*ROW.I:GOTO 976
973 REM IF VOLLIQU.IT > 0 THEN TOTOPVOLL=ABS(VOLLIQU.IT):ELSE TOTOPVOLL=0
974 REM IF (ASSETP.IRA+ASSETP.IO)>0 AND VOLLIQU.IT > (ASSETP.IRA+ASSETP.IO) THEN
 VOLLIQU.IT=VOLLIQU.IT-(ASSETP.IRA+ASSETP.IO): ELSE VOLLIQU.IT=VOLLIQU.IT
976 IF XASSETP.LO =0 AND XASSET.LR=0 THEN LOCATE 23,1:PRINT"You Now Have The Opt
ion of Selecting The Machinery Value Listed or Entering a 0":ELSE GOTO 985
977 LOCATE 20,49:PRINT S20$;:LOCATE 20,49:PRINT USING "$$######,###";XMACH;
980 LOCATE 20,61:PRINT S10$;:LOCATE 20,61:INPUT;" => ",A$
981 IF (VAL(A$)=0 AND LEN(A$)<>0 ) OR VAL(A$)=XMACH THEN GOTO 982:ELSE IF A$=""
THEN GOTO 980:ELSE GOTO 980
982 XMACH=VAL(A$):LOCATE 20,49:PRINT USING "$$######,###";XMACH;:PRINT S10$;
983 GOTO 990:REM THIS SKIPS LINE 985
985 LOCATE 20,49:PRINT USING "$$######,###";XMACH;
990 LOCATE 21,49:PRINT USING "$$######,###";XASSETP.LO+XASSET.LR+XMACH
992 IF (XASSETP.LO+XASSET.LR)=0 AND XMACH=0 THEN FLAG.DECISION=0:VOLLIQU.IT=0:IR
OWCOST=0:TOTOPVOLL=0:GOTO 1000:ELSE GOTO 993
993 IF (XASSETP.LO+XASSET.LR+MAXASSETP.IS)=0 AND XMACH<0 THEN FLAG.DECISION=2:VO
LLIQU.IT=IVOLLIQU.IT:TOTOPVOLL=ABS(VOLLIQU.IT):IROWCOST=ABS(IVOLLIQU.IT)*ROW.I:A
SSETP.IRA=0:GOTO 1000:ELSE FLAG.DECISION=1:GOTO 1000
994 REM IF XASSET.LR>0 AND (XASSETP.LO+MAXASSETP.IS)=0 AND XMACH<0 THEN VOLLIQU.
IT=ABS(IVOLLIQU.IT)-ASSETP.IRA:TOTOPVOLL=VOLLIQU.IT:IROWCOST=VOLLIQU.IT*ROW.I:FL
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AG.DECISION=1:GOTO 1000:ELSE 995
995 REM IF XASSET.LR>0 AND (XASSETP.LO+MAXASSETP.IS)=0 AND XMACH>0 THEN VOLLIQU.
IT=0:TOTOPVOLL=0:IROWCOST=0:ASSETP.IRA=ABS(XMACH)-IVOLLIQU.IT:FLAG.DECISION=1:GO
TO 1000:ELSE GOTO 996
996 REM IF XASSET.LR>0 AND XASSETP.LO>0 AND (XMACH-ASSETP.IRA)<0 AND MAXASSETP.I
S=0 THEN VOLLIQU.IT=(ABS(IVOLLIQU.IT)-ASSETP.IRA-ASSETP.IO)ASSETP.IO0):ASSETP.IO
=0:TOTOPVOLL=VOLLIQU.IT:IROWCOST=VOLLIQU.IT*ROW.I:FLAG.DECISION=1:GOTO 940:ELSE
997
997 REM IF XASSET.LR>0 AND IVOLLIQU.IT<>0 AND ASSETP.LO>0 AND (ABS(XMACH)-ASSETP
.IRA)>0 THEN ASSETP.IO=(XMACH-ASSETP.IRA+ABS(IVOLLIQU.IT)):VOLLIQU.IT=ABS(XMACH)
-ASSETP.IRA-ASSETP.IO):TOTOPVOLL=VOLLIQU.IT:IROWCOST=VOLLIQU.IT*ROW.I:FLAG.DECIS
ION=1:GOTO 1000
999 REM IF MAXASSETP.IS>0 THEN VOLLIQU.IT=0:TOTOPVOLL=0:IROWCOST=0:FLAG.DECISION
=1:GOTO 1000:ELSE GOTO 1000
1000 GOTO 940
1005 ZERO=0:REM VOLLIQU USER SELECTION SCREEN
1010 LOCATE 16,1:PRINT TAB(22);"Select Up To The Indicated Amount"
1015 PRINT:PRINT TAB(15);"Rental Land                    ";USING "$$######,##
#";ZERO
1016 PRINT TAB(15);"Owned Farm Land                      "; USING "$$######,###";ZE
RO
1017 PRINT TAB(15);"Machinery                            "; USING "$$######,###";ZE
RO
1019 PRINT TAB(15);"Prepaid Lease                        "; USING "$$######,###";ZE
RO
1021 PRINT TAB(15);"Total Assets Liquidated/Released     "; USING "$$######,###";ZE
RO
1022 LOCATE 24,23:PRINT"Do You Want To Liquidate Assets?";
1023 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1023:ELSE LOCATE 24,20:PRINT S39$;
1024 D=INSTR(DEE$,D$):IF D < 4 THEN FLAG.DECISION=0:GOTO 1160:ELSE LOCATE 24,1:P
RINT S79$;:FLAG.DECISION=2:GOTO 1030
1025 LOCATE 24,1:PRINT S79$;:LOCATE 24,23:PRINT"Do You Want To Make Any Changes
? ";
1026 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1026:ELSE LOCATE 24,20:PRINT S39$;
1027 D=INSTR(DEE$,D$):IF D < 4 THEN VOLLIQU.LO=XVOLLIQU.LO:VOLLIQU.LR=XVOLLIQU.L
R:VOLLIQU.I=(VOLLIQU.LR+VOLLIQU.LO)*GAMMA1S.I:VOLLIQU.C=VOLLIQU.LR*(RRPA/PPRA):T
OTOPVOLL=ABS(XMACH+VOLLIQU.LO+VOLLIQU.C):ELSE LOCATE 24,1:PRINT S79$;:GOTO 1030
1028 IF XMACH=0 THEN VOLLIQU.IT=0:VOLLIQU.I=0:GOTO 1160:ELSE GOTO 1160
1030 LOCATE 18,61:PRINT S10$;:LOCATE 18,61:INPUT;" => ",A$:IF A$ < > "" THEN XVO
LLIQU.LR=VAL(A$):LOCATE 18,49:PRINT USING "$$######,###";XVOLLIQU.LR;:PRINT S10$
;:ELSE LOCATE 18,61:PRINT S10$;
1035 LOCATE 19,61:PRINT S10$;:LOCATE 19,61:INPUT;" => ",A$:IF A$ < > "" THEN XVO
LLIQU.LO=VAL(A$):LOCATE 19,49:PRINT USING "$$######,###";XVOLLIQU.LO;:PRINT S10$
;:ELSE LOCATE 19,61:PRINT S10$;
1036 XMACH=INT(((XVOLLIQU.LO+XVOLLIQU.LR)*GAMMA1S.I)+IVOLLIQU.IT-MAXASSETP.IS):I
F MAXASSETP.IS > 0 THEN VOLLIQU.IT=0
1037 IF XVOLLIQU.LO =0 AND XVOLLIQU.LR=0 THEN LOCATE 24,1:PRINT"You Now Have The
 Option of Selecting The Machinery Value Listed or Entering a 0";:ELSE GOTO 1050
1038 LOCATE 20,49:PRINT S20$;:LOCATE 20,49:PRINT USING "$$######,###";XMACH;
1039 LOCATE 20,61:PRINT S10$;:LOCATE 20,61:INPUT;" => ",A$
1040 IF (VAL(A$)=0 AND LEN(A$)<>0 ) OR VAL(A$)=XMACH THEN GOTO 1041:ELSE IF A$="
" THEN GOTO 1038:ELSE GOTO 1038
1041 XMACH=VAL(A$):LOCATE 20,49:PRINT USING "$$######,###";XMACH;:PRINT S10$;
1045 GOTO 1055
1050 LOCATE 20,49:PRINT USING "$$######,###";XMACH;
1055 LOCATE 21,49:PRINT USING "$$######,###";XVOLLIQU.LR*(RRPA/PPRA)
1058 LOCATE 22,49:PRINT USING "$$######,###";XVOLLIQU.LO+XVOLLIQU.LR+XMACH+XVOLL
IQU.LR*(RRPA/PPRA)
1059 IF (XVOLLIQU.LO+XVOLLIQU.LR+XMACH+XVOLLIQU.LR*(RRPA/PPRA))=0 THEN FLAG.DECI
SION=0:ELSE FLAG.DECISION=2
```

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1060 GOTO 1025
1160 REM HERE WE ARE AFTER A DECISION HAS BEEN MADE
1165 IF FLAG.DECISION = 0 THEN GOTO 1166:ELSE GOTO 1170
1166 ASSETP.LO=0:ASSET.LR=0:ASSETP.IRA=0:ASSETP.IO=0:MAXASSETP.IS=0
1167 SVOLLCB.L=0:VOLLIQU.I=0:VOLLIQU.C=0:VOLLIQU.LR=0:VOLLIQU.IT=0:VOLLIQU.LO=0:
SLIQSHT=0:SVOLLRES=0:SNETVOLL.I=0:SNETVOLL.L=0:IVOLLIQU.IT=0:TOTOPVOLL=0:IROWCOS
T=0
1168 GOSUB 2230:TROFF:GOTO 1180
1170 IF FLAG.DECISION = 1 THEN GOSUB 2290:ELSE GOSUB 2290
1180 CLS:ZERO=0:STOP
1195 IF SAVAILASS.C<0 THEN TSAVAILASS.C=0:ELSE TSAVAILASS.C=SAVAILASS.C
1196 IF TSAVAILASS.C=0 THEN GOTO 1460:ELSE GOTO 1197
1197 PRINT:PRINT TAB(29)"DEBT PREPAYMENT OPTION"
1200 LOCATE 6,10:PRINT"Total Cash Available to Reduce Debt  ";USING "$$######,##
#";TSAVAILASS.C:PRINT:PRINT
1210 PRINT:PRINT TAB(10);"Prepay Current Liabilities       " USING "$$######,###
";ZERO
1220 PRINT:PRINT TAB(10);"Prepay Intermediate Liabilities  ";USING "$$######,###
";ZERO
1230 PRINT:PRINT TAB(10);"Prepay Long Term Liabilities     ";USING "$$######,###
";ZERO
1240 PRINT:PRINT TAB(10);"Total Prepaid Debt               "; USING "$$######,##
#";ZERO
1250 LOCATE 20,15:INPUT"Do You Want To Make A Debt Prepayment ? ",A$:LOCATE 20,1
5:PRINT S39$;S20$
1260 IF A$="Y" OR A$="y" THEN 1290:ELSE IF A$="n" OR A$="N" THEN GOTO 1460:ELSE
 1250
1270 LOCATE 20,23:INPUT"Do you want to make any changes ? ",A$:LOCATE 20,20:PRIN
T S39$;
1280 IF A$="Y" OR A$="y" THEN 1290:ELSE IF A$="n" OR A$="N" THEN 1440:ELSE  1270
1290 LOCATE 10,57:PRINT S20$:LOCATE 10,57:INPUT" => ",A$:IF A$ < > "" THEN SPPDB
T.C=VAL(A$):LOCATE 10,43:PRINT USING "$$######,###";SPPDBT.C;:PRINT S20$;:ELSE L
OCATE 10,57:PRINT S20$;
1300 GOSUB 1370
1310 LOCATE 12,57:PRINT S20$:LOCATE 12,57:INPUT" => ",A$:IF A$ < > "" THEN SPPDB
T.I=VAL(A$):LOCATE 12,43:PRINT USING "$$######,###";SPPDBT.I;:PRINT S20$;:ELSE L
OCATE 12,57:PRINT S20$;
1320 GOSUB 1370
1330 LOCATE 14,57:PRINT S20$:LOCATE 14,57:INPUT" => ",A$:IF A$ < > "" THEN SPPDB
T.L=VAL(A$):LOCATE 14,43:PRINT USING "$$######,###";SPPDBT.L;:PRINT S20$;:ELSE L
OCATE 14,57:PRINT S20$;
1340 GOSUB 1370
1350 GOSUB 1400
1360 GOTO 1270
1370 LOCATE 16,43:PRINT S20$:LOCATE 16,43:PRINT USING "$$######,###";SPPDBT.I+SP
PDBT.C+SPPDBT.L:SPPDBT.T=SPPDBT.C+SPPDBT.I+SPPDBT.L
1380 LOCATE 6,47:PRINT S20$:LOCATE 6,47:PRINT USING "$$######,###";TSAVAILASS.C-
SPPDBT.C-SPPDBT.I-SPPDBT.L
1390 RETURN
1400 IF TSAVAILASS.C <= SPPDBT.C+SPPDBT.I+SPPDBT.L THEN GOTO 1410:ELSE RETURN
1410 LOCATE 20,5:COLOR 31:PRINT "* * *";:COLOR 7:PRINT "   Total Prepaid Debt Ca
nnot Exceed Available Cash   ";:COLOR 31:PRINT "* * *":COLOR 7:LOCATE 23,25:PRIN
T "Press < C > To Continue";
1420 IF INKEY$="" THEN 1420
1430 LOCATE 20,1:PRINT S39$;S39$;:LOCATE 23,1:PRINT S39$;S39$:GOTO 1290
1440 REM FINAL S-BALANCE SHEET TO INCLUDE PREPAID DEBT OPTION
1450 GOSUB 2290
1460 REM READY TO HAVE THE TRANSFORMATION TO THE INITIAL BALANCE SHEET
1470 REM SET SUMRED TO FINAL SEARCH SUMRED VALUE
1480 SUMRED=0:REM SUMRED=SSUMRED
```

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1490 REM TEST FOR PARCEL PURCHASE
1500 IF FLAG.DECISION=1 THEN P=P+1:SASSETP.L(P)=ASSETP.LO:SCBASE.L(P)=ASSETP.LO
1510 PAR=SPAR:FOR I=1 TO P:CBASE.L(I)=SCBASE.L(I):ASSETP.L(I)=SASSETP.L(I):NEXT
I
1520 ASSETP.L(PAR)=ASSETP.L(PAR)*(1-SUMRED)
1530 SUM=0:FOR I= 1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
1540 SUM=0:FOR I= 1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
1550 CCGT.L=(ASSET.L-CBASET.L)*TAXRATE
1560 DBT.L=SDBT.L
1570 CP.L=(1/TERM.L)*DBT.L
1575 CYRCP.L=CP.L
1580 LPDBT.L=DBT.L-CP.L
1585 RLPDBT.L=LPDBT.L:REM REQUIRED IF REFINANCING W/ REAL ESTATE DEBT IN MOD5
1590 TDBT.L=LPDBT.L+CCGT.L
1600 EQTPOS.L=ASSET.L-DBT.L
1610 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
1620 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
1630 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
1640 REM EQUATIONS FOR DETERMINING THE MARKET VALUE OF RENTED LAND
1650 AO=TAO
1660 AR=TAR
1670 ASSET.PLR=SASSET.PLR
1680 ASSET.LRT=ASSET.PLR+ASSET.LR
1690 IF TAO>0 THEN PPRA=ASSET.L/AO: ELSE PPRA=20*RRPA
1700 REM MACHINERY ACCOUNTS UPDATE
1710 ASSET.I=SASSET.I
1720 MEMV=ASSET.I
1730 MECB=SMECB
1740 MEBV=SMEBV
1741 REM TEMPORARY VARIABLES FOR B/S UPDATE IN MODULE 5
1742 IASSET.I=ASSET.I
1743 IMECB=MECB
1744 IMEBV=MEBV
1750 ACCDEP=MECB-MEBV
1760 CCGT.I=(ASSET.I-MEBV)*TAXRATE
1765 IF CCGT.I < 0 THEN CCGT.I=0:ELSE CCGT.I=CCGT.I
1770 DBT.I=SDBT.I
1780 CP.I=(1/TERM.I)*DBT.I
1785 CYRCP.I=CP.I
1790 LPDBT.I=DBT.I-CP.I
1800 TDBT.I=LPDBT.I+CCGT.I
1810 EQTPOS.I=ASSET.I-DBT.I
1820 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
1830 CRDRESR.I=((1-ROW.I)*(1-DEL.I)/ROW.I)*EQTPOS.I-DBT.I
1840 CRDRESM.I=((1-ROW.I)/ROW.I)*EQTPOSM.I-(DBT.I+CCGT.I)
1850 REM CURRENT ASSET ACCOUNTS
1860 IF ASSET.PLR = 0 AND ASSET.LR=0 THEN PPDLEASE=0:ELSE PPDLEASE=(AR)*RRPA
1870 IF ASSET.PLR= 0 AND ASSET.LR=0 THEN LEAPAY.C=0:ELSE LEAPAY.C=(AR)*RRPA*.5
1880 ASSET.C=SASSET.C
1890 TASSET.C=ASSET.C+PPDLEASE
1900 DBT.C=SDBT.C
1910 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
1920 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
1930 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
1940 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
1950 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
1960 CRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
1970 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
1980 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
1990 CURRATIO=TASSET.C/TDBT.C
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2010 GAMMA1S=ASSET.I/(ASSET.L+ASSET.LRT)
2020 TASSET.CB=TASSET.C+MEBV+CBASET.L
2030 TASSETS.M=TASSET.C+ASSET.I+ASSET.L
2040 TDBT.CB=TDBT.C+LPDBT.I+LPDBT.L
2050 TDBT.M=TDBT.C+TDBT.I+TDBT.L
2060 TEQTPOS.CB=TASSET.CB-TDBT.CB
2070 TEQTPOS.M=TASSETS.M-TDBT.M
2080 INDBT.L=DBT.L*IN.L
2085 CYRINDBT.L=INDBT.L
2090 INDBT.I=DBT.I*IN.I
2095 CYRINDBT.I=INDBT.I
2100 INDBT.C=DBT.C*IN.C
2101 PPDBT.C=SPPDBT.C
2102 PPDBT.I=SPPDBT.I
2103 PPDBT.L=SPPDBT.L
2104 PPDBT.T=SPPDBT.T
2105 CYRINDBT.C=INDBT.C
2110 TASSETS.TA=TASSETS.M+(ASSET.PLR+ASSET.LR)
2120 ROW.WE0=((ROW.I*GAMMA1S+ROW.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(ROW.I*GAMMA1S*ASSET.LRT+ROW.C*TASSET.C)/(TASSETS.M)
2130 DEL.WE0=((DEL.I*GAMMA1S+DEL.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(DEL.I*GAMMA1S*ASSET.LRT+DEL.C*TASSET.C)/(TASSETS.M)
2140 REM SCRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*(TASSETS.M-DBT.C-LEAPAY.
C-DBT.I-DBT.L)-(DBT.C+LEAPAY.C+DBT.I+DBT.L)
2150 CRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*TEQTPOS.M-TDBT.M
2159 IN.W=(IN.C*DBT.C+IN.I*DBT.I+IN.L*DBT.L)/TDBT.CB
2160 CRDRESM.W=((1-ROW.WE0)/ROW.WE0)*TEQTPOS.M-TDBT.M
2161 REM CALCULATE E0 AND E1
2162 E0= (((ROW.WE0+IN.W)*TDBT.M-(1-ROW.WE0)*TEQTPOS.M+WITHDLS)/TASSETS.M)-RBAR
2163 E1NUM= ((ROW.WE0+IN.W-IN.W*DEL.WE0*(1-ROW.WE0))*(DBT.C+SLEAPAY.C+DBT.I+DBT.
L)-(1-ROW.WE0-DEL.WE0+ROW.WE0*DEL.WE0)*TEQTPOS.M+WITHDRLS*(1-DEL.WE0*(1-ROW.WE0)
))
2164 E1DEN= (1-DEL.WE0*(1-ROW.WE0))*TASSETS.M
2165 E1=(E1NUM/E1DEN)-RBAR
2170 SUMMINCR=MINCR.C+MINCR.I+MINCR.L
2180 MAXER.W=(CRDRESR.W-SUMMINCR)/((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0+1)
2190 MAXEM.W=(((1-ROW.WE0)*TEQTPOS.M-ROW.WE0*TDBT.M-MAXER.W)-(SUMMINCR/((1-ROW.W
E0)*(1-DEL.WE0)/ROW.WE0+1)))*(1-ROW.WE0)+(SUMMINCR/((1-ROW.WE0)*(1-DEL.WE0)/ROW.
WE0+1))+MAXER.W
2195 PIPMT=CP.I+CP.L+INDBT.I+INDBT.L
2196 CYRPIPMT=CYRCP.I+CYRCP.L+CYRINDBT.I+CYRINDBT.L
2198 CAPINV=(ASSETP.LO+ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)
2200 REM BANKRUPTCY SUBROUTINE
2210 IF (1-ROW.WE0)*TASSETS.M <= TDBT.M THEN TASSET.C=0:ASSET.I=0:ASSET.L=0:TDBT
.C=0:TDBT.I=0:TDBT.L=0:CLS:LOCATE 15,20:PRINT "SORRY, BUT YOU'RE BANKRUPT ! TRY
AGAIN ... ":STOP
2211 GOSUB 3520:TRON
2212 IF FLAG.DECISION=0 THEN ASSETP.IRA=0:ASSETP.IO=0:MAXASSETP.IS=0:VOLLIQU.I=0
:IVOLLIQU.IT=0:VOLLIQU.IT=0:VOLLIQU.LO=0:VOLLIQU.LR=0:VOLLIQU.T=0:IROWCOST=0:TOT
OPVOLL=0:VOLLIQU.T=0:GOTO 2225:ELSE GOTO 2213
2213 IF FLAG.DECISION=2 AND ABS(VOLLIQU.I+IVOLLIQU.IT)> 0 THEN VOLLIQU.IT=ABS(IV
OLLIQU.IT):TOTOPVOLL=(ABS(VOLLIQU.IT)+VOLLIQU.I+VOLLIQU.LO+VOLLIQU.C):IROWCOST=(
(ABS(VOLLIQU.IT)+VOLLIQU.I)*ROW.I+VOLLIQU.LO*ROW.L+VOLLIQU.C):GOTO 2214
2214 IF FLAG.DECISION=2 AND VOLLIQU.I > 0 OR FLAG.DECISION=2 AND ABS(IVOLLIQU.IT
)> 0 THEN RTROWCOST=IROWCOST:GOTO 2226 ELSE GOTO 2215
2215 IF FLAG.DECISION=1 AND XMACH>0 AND (ASSETP.LO+ASSET.LR)=0 THEN CAPINV=MAXAS
SETP.IS:VOLLIQU.IT=0:TOTOPVOLL=0:IROWCOST=0:VOLLIQU.T=0:GOTO 2227:ELSE GOTO 2216
2216 IF FLAG.DECISION=1 AND XMACH<0 AND (ASSETP.LO+ASSET.LR)=0 THEN CAPINV=0:VOL
LIQU.IT=IVOLLIQU.IT:TOTOPVOLL=VOLLIQU.IT:IROWCOST=VOLLIQU.IT*ROW.I:VOLLIQU.T=VOL
LIQU.IT:MAXASSETP.IS=0:GOTO 2227:ELSE GOTO 2217
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2217 IF FLAG.DECISION=1 AND (ASSETP.LO+MAXASSETP.IS)=0 AND ASSET.LR>0 AND XMACH>
0 THEN CAPINV=ASSETP.IRA-IVOLLIQU.IT:VOLLIQU.IT=IVOLLIQU.IT:TOTOPVOLL=VOLLIQU.IT
:IROWCOST=VOLLIQU.IT*ROW.I:VOLLIQU.T=VOLLIQU.IT:RTROWCOST=IROWCOST:GOTO 2227:ELS
E GOTO 2218
2218 IF FLAG.DECISION=1 AND (ASSETP.LO+MAXASSETP.IS)=0 AND ASSET.LR>0 AND XMACH<
0 THEN CAPINV=0:VOLLIQU.IT=IVOLLIQU.IT-ASSETP.IRA:TOTOPVOLL=VOLLIQU.IT:IROWCOST=
VOLLIQU.IT*ROW.I:VOLLIQU.T=VOLLIQU.IT:RTROWCOST=IROWCOST:GOTO 2227:ELSE GOTO 221
9
2219 IF FLAG.DECISION=1 AND XMACH>0 AND ASSETP.LO=0 AND ASSET.LR>0 THEN CAPINV=(
ASSET.LR*GAMMA1S.I+MAXASSETP.IS):VOLLIQU.IT=0:TOTOPVOLL=0:IROWCOST=0:VOLLIQU.T=0
:RTROWCOST=0:GOTO 2227:ELSE GOTO 2220
2220 IF XMACH>0 AND ASSETP.LO>0 AND (MAXASSETP.IS+ASSET.LR)=0 THEN CAPINV=ASSETP
.LO+ASSETP.LO*GAMMA1S.I-IVOLLIQU.IT:VOLLIQU.IT=IVOLLIQU.IT:TOTOPVOLL=VOLLIQU.IT:
IROWCOST=0:VOLLIQU.T=VOLLIQU.IT:RTROWCOST=IROWCOST:GOTO 2227:ELSE GOTO 2222
2222 IF FLAG.DECISION=1 AND (XMACH+ASSET.LR)=<0 AND ASSETP.LO>0 AND ASSET.LR=0 T
HEN CAPINV=ASSETP.LO:VOLLIQU.IT=IVOLLIQU.IT-ASSETP.IO:TOTOPVOLL=VOLLIQU.IT:IROWC
OST=VOLLIQU.IT*ROW.I:VOLLIQU.T=VOLLIQU.IT:RTROWCOST=IROWCOST:GOTO 2227:ELSE GOTO
 2223
2223 IF FLAG.DECISION=1 AND XMACH<0 AND (ASSETP.LO+ASSET.LR)>0 THEN CAPINV=ASSET
P.LO:VOLLIQU.IT=(IVOLLIQU.IT-ASSETP.IO-ASSETP.IRA):IROWCOST=VOLLIQU.IT*ROW.I:TOT
OPVOLL=VOLLIQU.IT:VOLLIQU.T=VOLLIQU.IT:RTROWCOST=IROWCOST:GOTO 2227:ELSE GOTO 22
24
2224 IF FLAG.DECISION=1 AND XMACH>0 AND (ASSETP.LO+ASSET.LR)>0 THEN CAPINV=ASSET
P.LO+XMACH:VOLLIQU.IT=0:IROWCOST=0:TOTOPVOLL=VOLLIQU.IT:VOLLIQU.T=VOLLIQU.IT:RTR
OWCOST=IROWCOST:GOTO 2226
2225 IF FLAG.DECISION=0 THEN CAPINV=0:GOTO 2227:ELSE GOTO 2226
2226 IF FLAG.DECISION=2 THEN CAPINV=MAXASSETP.IS:VOLLIQU.T=TOTOPVOLL:GOTO 2227
2227 IF CAPINV < 0 THEN CAPINV=0
2228 STOP:TROFF:CLS:LOCATE 9,27:PRINT " Model Now Loading Module No. 6a"
2229 STORE=3:CHAIN "MOD6A",,ALL
2230 REM TEMP BALANCE SHEET EQUATIONS FOR USE IN OPT. SUBROUTINE
2240 REM REAL ESTATE ACCOUNTS UPDATE
2250 REM SET ASSET PURCHASE AND VOLLIQU ACCOUNTS TO ZERO FOR FLAG.DECISION=0
2260 ASSETP.LO=0:ASSET.LR=0:ASSETP.IRA=0:ASSETP.IO=0:MAXASSETP.IS=0
2280 SVOLLCB.L=0:VOLLIQU.I=0:VOLLIQU.C=0:VOLLIQU.LR=0:VOLLIQU.IT=0:VOLLIQU.LO=0:
SLIQSHT=0:SVOLLRES=0:SNETVOLL.I=0:SNETVOLL.L=0:IVOLLIQU.IT=0:SVOLLIQU.LO=0:VOLLI
QU.IO=0:XMACH=0
2290 REM RESET SSUMRED TO ORIGINAL SUMRED VALUE
2300 SSUMRED=SUMRED:SVOLLIQU.LO=VOLLIQU.LO
2310 SPAR=PAR:SP=P:FOR I=1 TO SP:SCBASE.L(I)=CBASE.L(I):SASSETP.L(I)=ASSETP.L(I)
:NEXT I
2320 REM CALCULATING SVOLLCB.L
2330 SVOLLCB.L=(SVOLLIQU.LO+SLIQSHT+SVOLLRES)/(SASSETP.L(SPAR))
2340 SLIQSHT=0:SVOLLRES=0
2350 IF SVOLLCB.L=0 THEN GOTO 2410
2360 REM TEMPORARY ACCOUNT TO PROVIDE BASIS FOR UPDATING TAO, LINE 765
2370 VSASSET.L=ASSET.L
2380 IF SVOLLCB.L>1 THEN 2620
2390 SSUMRED=SUMRED+SVOLLCB.L
2400 IF SSUMRED>=1 THEN GOTO 2510:ELSE GOTO 2450 :REM CALCULATE LIQSHT
2410 REM UPDATE THE SASSET.L AND SCBASET.L ACCOUNTS
2420 SASSET.L=ASSET.L+ASSETP.LO:SCBASET.L=CBASET.L+ASSETP.LO
2430 REM SIMPLE CASE CONTINUE ON TO REST OF LAND EQUATIONS
2440 GOTO 2720
2450 REM RECALC S-PARCELS WHEN SSUMRED < 1
2460 SCBASE.L(SPAR)=SCBASE.L(SPAR)*(1-SSUMRED)
2470 SASSETP.L(SPAR)=SASSETP.L(SPAR)*(1-SSUMRED)
2480 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
2490 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
2500 GOTO 2720:REM CONTINUE REAL ESTATE UPDATE CALCULATIONS
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2510 REM CALCULATE LIQSHT
2520 SLIQSHT=(SSUMRED-1)*SASSETP.L(SPAR)
2530 IF SSUMRED>=1 THEN SCBASE.L(SPAR)=0:SASSETP.L(SPAR)=0:SSUMRED=0:SVOLLIQU.LO
=0
2540 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
2550 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
2560 REM BANKRUPTCY TEST
2570 SPAR=SPAR+1
2580 IF SPAR > SP THEN GOTO 3480 :REM BANKRUPTCY SUBROUTINE
2590 REM GO BACK TO CALC NEW SVOLLCB.L
2600 GOTO 2330
2610 REM ROUTINE FOR VOLLCB.L>1
2620 REM CALCULATE SVOLLRES
2630 SVOLLRES=SVOLLIQU.LO-SASSETP.L(SPAR)
2640 SCBASE.L(SPAR)=0:SASSETP.L(SPAR)=0:SSUMRED=0:SVOLLIQU.LO=0
2650 SUM=0:FOR I= 1 TO SP:SUM=SUM+SCBASE.L(I):NEXT I:SCBASET.L=SUM
2660 SUM=0:FOR I= 1 TO SP:SUM=SUM+SASSETP.L(I):NEXT I:SASSET.L=SUM
2670 SPAR=SPAR+1
2680 IF SPAR>SP THEN PRINT"GOTO BANKRUPTCY ROUTINE":GOTO 3480
2690 GOTO 2330:REM CALCULATE NEW VOLLCB.L
2700 IF VOLLIQU.LO*(1-ROW.L) < (DBT.L+ASSETP.LO*(1-CASHDP.L)) THEN GOTO 2710:ELS
E GOTO 2720
2710 SNETVOLL.L=(VOLLIQU.LO*(1-ROW.L))-SDBT.L
2720 SCCGT.L=(SASSET.L-SCBASET.L)*TAXRATE
2730 IF (VOLLIQU.LO*(1-ROW.L))>=(DBT.L+ASSETP.LO*(1-CASHDP.L)) THEN SDBT.L=0:GOT
O 2750: ELSE GOTO 2740
2740 SDBT.L=DBT.L+ASSETP.LO*(1-CASHDP.L)-(1-ROW.L)*VOLLIQU.LO-SPPDBT.L
2750 SCP.L=(1/TERM.L)*SDBT.L
2760 SLPDBT.L=SDBT.L-SCP.L
2770 STDBT.L=SLPDBT.L+SCCGT.L
2780 SEQTPOS.L=SASSET.L-SDBT.L
2790 SEQTPOSM.L=SASSET.L-(SDBT.L+SCCGT.L)
2800 SCRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*SEQTPOS.L-SDBT.L
2810 SCRDRESM.L=((1-ROW.L)/ROW.L)*SEQTPOSM.L-(SDBT.L+SCCGT.L)
2820 REM EQUATIONS FOR DETERMINING THE MARKET VALUE OF RENTED LAND
2825 PRINT "VOLLIQU.LO,TAO,AO,ASSETP.LO,PPPA,VSASSET.L";VOLLIQU.LO;TAO;AO;ASSETP
.LO;PPPA;VSASSET.L
2830 IF VOLLIQU.LO>0 THEN TAO=AO - (VOLLIQU.LO/(VSASSET.L/AO)):ELSE TAO=AO + (AS
SETP.LO/PPPA)
2840 REM TAO=AO + (ASSETP.LO/PPPA)- (VOLLIQU.LO/(VSASSET.L/AO))
2850 TAR=AR+(ASSET.LR/PPRA)-(VOLLIQU.LR/PPRA)
2860 SASSET.PLR=ASSET.PLR-VOLLIQU.LR
2870 ASSET.LRT=SASSET.PLR+ASSET.LR
2880 IF TAO>0 THEN SPPRA=SASSET.L/TAO: ELSE SPPRA=20*RRPA
2890 REM MACHINERY ACCOUNTS UPDATE
2895 IF FLAG.DECISION=0 THEN GOTO 2896:ELSE GOTO 2900
2896 SASSET.I=ASSET.I:SMEMV=MEMV:SMECB=MECB:SMEBV=MEBV:SACCDEP=SMECB-SMEBV:SDBT.
I=DBT.I-SPPDBT.I:SCCGT.I=CCGT.I:GOTO 3000
2900 IF ((VOLLIQU.I+IVOLLIQU.IT)*(1-ROW.I))<(DBT.I+((ASSETP.IRA+MAXASSETP.IS)*(1
-CASHDP.I))+ASSETP.IO*(1-CASHDP.I)) THEN SNETVOLL.I=0:GOTO 2920:ELSE 2910
2910 SNETVOLL.I=((VOLLIQU.I+IVOLLIQU.IT)*(1-ROW.I))-(DBT.I+(ASSETP.IO+ASSETP.IRA
+MAXASSETP.IS)*(1-CASHDP.I))
2920 SASSET.I=ASSET.I+ASSETP.IRA+MAXASSETP.IS+ASSETP.IO-IVOLLIQU.IT-VOLLIQU.I-VO
LLIQMIN.I
2925 REM SNETVOLL.I=0
2930 SMEMV=SASSET.I
2935 IF (IVOLLIQU.IT+VOLLIQU.I) > (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) THEN SMECB
=MECB-((MECB/MEMV)*(IVOLLIQU.IT+VOLLIQU.I-ASSETP.IRA-ASSETP.IO-MAXASSETP.IS)):EL
SE SMECB=MECB+(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-IVOLLIQU.IT-VOLLIQU.I)
2937 IF (IVOLLIQU.IT+VOLLIQU.I) > (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) THEN SMEBV
```

```
=MEBV-((MEBV/MEMV)*(IVOLLIQU.IT+VOLLIQU.I-ASSETP.IRA-ASSETP.IO-MAXASSETP.IS)):EL
SE SMEBV=MEBV+(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-IVOLLIQU.IT-VOLLIQU.I)
2940 REM SMECB=MECB+ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-((MECB/MEMV)*(VOLLIQU.I+VO
LLIQU.IT))
2950 REM SMEBV=MEBV+ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-((MEBV/MEMV)*(VOLLIQU.I+VO
LLIQU.IT))
2960 SACCDEP=SMECB-SMEBV
2970 SCCGT.I=(SASSET.I-SMEBV)*TAXRATE
2971 IF (IVOLLIQU.IT+VOLLIQU.I)>(ASSETP.IO+ASSETP.IRA+MAXASSETP.IS) AND ((IVOLLI
QU.IT+VOLLIQU.I)*(1-ROW.I)-(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)*(1-CASHDP.I)) < D
BT.I THEN GOTO 2972:ELSE GOTO 2973
2972 SDBT.I=DBT.I-(IVOLLIQU.IT+VOLLIQU.I)*(1-ROW.I)+(ASSETP.IRA+ASSETP.IO+MAXASS
ETP.IS)*(1-CASHDP.I)-SPPDBT.I:GOTO 3000
2973 IF (IVOLLIQU.IT+VOLLIQU.I) > (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) AND ((IVOL
LIQU.IT+VOLLIQU.I)*(1-ROW.I)-(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)*(1-CASHDP.I)) >
 DBT.I THEN SDBT.I=0:GOTO 3000:ELSE GOTO 2975
2975 IF (IVOLLIQU.IT+VOLLIQU.I) < (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) THEN SDBT.
I=DBT.I +(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS)*(1-CASHDP.I)-(IVOLLIQU.IT+VOLLIQU.I
)*(1-ROW.I)-SPPDBT.I
3000 SCP.I=(1/TERM.I)*SDBT.I
3010 SLPDBT.I=SDBT.I-SCP.I
3020 STDBT.I=SLPDBT.I+SCCGT.I
3030 SEQTPOS.I=SASSET.I-SDBT.I
3040 SEQTPOSM.I=SASSET.I-(SDBT.I+SCCGT.I)
3050 SCRDRESR.I=((1-ROW.I)*(1-DEL.I)/ROW.I)*SEQTPOS.I-SDBT.I
3060 SCRDRESM.I=((1-ROW.I)/ROW.I)*SEQTPOSM.I-(SDBT.I+SCCGT.I)
3070 REM CURRENT ASSET ACCOUNTS
3080 IF SASSET.PLR = 0 AND ASSET.LR=0 THEN SPPDLEASE=0:ELSE SPPDLEASE= (TAR)*RRP
A
3090 IF SASSET.PLR= 0 AND ASSET.LR=0 THEN SLEAPAY.C=0:ELSE SLEAPAY.C=(TAR)*RRPA*
.5
3092 IF FLAG.DECISION=0 THEN GOTO 3095:ELSE GOTO 3105
3095 SASSET.C=ASSET.C-SPPDBT.T+SNETVOLL.I+SNETVOLL.L:GOTO 3110
3100 REM SASSET.C=ASSET.C-((ASSETP.IRA+MAXASSETP.IS)*CASHDP.I)-(ASSETP.IO*CASHDP
.I)-(ASSETP.LO*CASHDP.L)-SPPDBT.T+SNETVOLL.I+SNETVOLL.L
3105 IF (IVOLLIQU.IT+VOLLIQU.I) > (ASSETP.IRA+ASSETP.IO+MAXASSETP.IS) THEN SASSE
T.C=ASSET.C-(ASSETP.LO*CASHDP.L)-SPPDBT.T+SNETVOLL.I+SNETVOLL.L:GOTO 3110:ELSE G
OTO 3106
3106 SASSET.C=ASSET.C-(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS-IVOLLIQU.IT-VOLLIQU.I)*
CASHDP.I-(ASSETP.LO*CASHDP.L)-SPPDBT.T+SNETVOLL.I+SNETVOLL.L
3110 STASSET.C=SASSET.C+SPPDLEASE
3120 SDBT.C=DBT.C-SPPDBT.C+((ASSET.LR/PPRA)*RRPA*.5)-VOLLIQU.C*.5
3130 STDBT.C=SDBT.C+SCP.I+SCP.L+SLEAPAY.C
3140 SEQTPOS.C=STASSET.C-(SDBT.C+SLEAPAY.C)
3150 SAEQTPOS.C=STASSET.C-(SDBT.C+SLEAPAY.C)*MINRATIO.C
3160 SEQTPOSM.C=STASSET.C-(SDBT.C+SLEAPAY.C)
3170 SMINEQTPOS.C=(STDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
3180 SCRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*SEQTPOS.C-(SDBT.C+SLEAPAY.C)
3190 SCRDRESM.C=((1-ROW.C)/ROW.C)*SEQTPOSM.C-(SDBT.C+SLEAPAY.C)
3200 SAVAILASS.C=SAEQTPOS.C-SMINEQTPOS.C
3205 REM LPRINT"ASSET.C,SASSET.C,STASSET.CDBT.C,SDBT.C,STDBT.C,SLEAPAY.C,SMINEQT
POS.C,SAVAILASS.C"
3206 REM LPRINT ASSET.C;SASSET.C;STASSET.C;DBT.C;SDBT.C;STDBT.C;SLEAPAY.C;SMINEQ
TPOS.C;SAVAILASS.C
3210 SCURRATIO=STASSET.C/STDBT.C
3220 REM OTHER MISC. BALANCE SHEET EQUATIONS
3230 REM GAMMA1S=SASSET.I/(SASSET.L+ASSET.LRT)
3240 STASSET.CB=STASSET.C+SMEBV+SCBASET.L
3250 STASSETS.M=STASSET.C+SASSET.I+SASSET.L
3260 TASSETS.M=TASSET.C+ASSET.I+ASSET.L
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3270 STDBT.CB=STDBT.C+SLPDBT.I+SLPDBT.L
3280 STDBT.M=STDBT.C+STDBT.I+STDBT.L
3290 STEQTPOS.CB=STASSET.CB-STDBT.CB
3300 STEQTPOS.M=STASSETS.M-STDBT.M
3310 SINDBT.L=SDBT.L*IN.L
3320 SINDBT.I=SDBT.I*IN.I
3330 SINDBT.C=SDBT.C*IN.C
3340 TASSETS.TA=TASSETS.M+ASSET.PLR
3350 STASSETS.TA=STASSETS.M+(SASSET.PLR+ASSET.LR)
3360 TSCRDRESR.C=RCRDRESR.C=0
3370 REM THESE ASSET CONVERSIONS ARE USED TO CALCULATE TXGAIN IN MODULE #5
3380 TXASSET.I=ASSET.I:TXSASSET.I=SASSET.I:TXMEBV=MEBV:TXSMEBV=SMEBV
3390 TXASSET.L=ASSET.L:TXSASSET.L=SASSET.L:TXCBASET.L=CBASET.L:TXSCBASET.L=SCBAS
ET.L
3400 ROW.WE0=((ROW.I*GAMMA1S.I+ROW.L)*((STASSETS.M)-STASSET.C-GAMMA1S.I*ASSET.LR
T))/((1+GAMMA1S.I)*(STASSETS.M))+(ROW.I*GAMMA1S.I*ASSET.LRT+ROW.C*STASSET.C)/(ST
ASSETS.M)
3410 DEL.WE0=((DEL.I*GAMMA1S.I+DEL.L)*((STASSETS.M)-STASSET.C-GAMMA1S.I*ASSET.LR
T))/((1+GAMMA1S.I)*(STASSETS.M))+(DEL.I*GAMMA1S.I*ASSET.LRT+DEL.C*STASSET.C)/(ST
ASSETS.M)
3420 REM SCRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*(STASSETS.M-SDBT.C-SLEAP
AY.C-SDBT.I-SDBT.L)-(SDBT.C+SLEAPAY.C+SDBT.I+SDBT.L)
3430 SCRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*STEQTPOS.M-STDBT.M
3440 SCRDRESM.W=((1-ROW.WE0)/ROW.WE0)*STEQTPOS.M-STDBT.M
3450 SUMMINCR=MINCR.C+MINCR.I+MINCR.L
3460 MAXER.W=(SCRDRESR.W-SUMMINCR)/((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0+1)
3470 MAXEM.W=(((1-ROW.WE0)*STEQTPOS.M-ROW.WE0*STDBT.M-MAXER.W)-(SUMMINCR/((1-ROW
.WE0)*(1-DEL.WE0)/ROW.WE0+1)))*(1-ROW.WE0)+(SUMMINCR/((1-ROW.WE0)*(1-DEL.WE0)/RO
W.WE0+1))+MAXER.W
3480 REM BANKRUPTCY SUBROUTINE
3490 IF (1-ROW.WE0)*STASSETS.M <= STDBT.M THEN SASSET.C=0:SASSET.I=0:SASSET.L=0:
SDBT.C=0:SDBT.I=0:SDBT.L=0:CLS:LOCATE 15,20:PRINT "SORRY, BUT YOU'RE BANKRUPT !
TRY AGAIN ... ":STOP
3500 IF SPAR > SP THEN:STOP
3510 RETURN
3520 REM "S" TRANSFORMATION BALANCE SHEET OUTPUT SUBROUTINE
3530 CLS:KEY OFF
3540 REM IF AO < > 0 THEN AO=SASSET.L/VALPAO
3550 PRINT TAB(1);"BALANCE SHEET AFTER FINANCIAL DECISIONS-JANUARY 1,";TAB(52);:
PRINT USING "####";YEAR;:PRINT TAB(60);"PAGE 1"
3560 PRINT TAB(1);"ASSETS";TAB(40);"MODIFIED COST";TAB(65);"MARKET VALUE":PRINT
3570 PRINT TAB(1);"CURRENT ASSETS"
3580 PRINT TAB(3);"- Cash / Cash Equivalent";TAB(40);:PRINT USING"$$######,###";
SASSET.C;:PRINT TAB(65);:PRINT USING"$$######,###";SASSET.C
3590 PRINT TAB(3);"- Prepaid Land Lease";TAB(40);:PRINT USING"$$######,###";SPPD
LEASE;:PRINT TAB(65);:PRINT USING"$$######,###";SPPDLEASE
3600 PRINT TAB(1);"TOTAL CURRENT ASSETS";TAB(40);:PRINT USING"$$######,###";STAS
SET.C;:PRINT TAB(65);:PRINT USING"$$######,###";STASSET.C
3610 PRINT:PRINT TAB(1);"INTERMEDIATE ASSETS"
3620 PRINT TAB(3);"- Machinery and Bldg"
3630 PRINT TAB(8);"- Cost";TAB(30);:PRINT USING"$$######,###";SMECB;:PRINT TAB(6
5);:PRINT USING"$$######,###";SASSET.I
3640 PRINT TAB(8);"- Acc. Dep.";TAB(30);:PRINT USING"$$######,###";SACCDEP
3650 PRINT TAB(8);"- Book Value";TAB(40);:PRINT USING"$$######,###";SMEBV
3660 PRINT TAB(1);"TOTAL INTERMEDIATE ASSETS";TAB(40);:PRINT USING"$$######,###"
;SMEBV;:PRINT TAB(65);:PRINT USING"$$######,###";SASSET.I
3670 PRINT:PRINT TAB(1);"LAND (acres: own=";INT(TAO);" )";TAB(40);:PRINT USING"$
$######,###";SCBASET.L;:PRINT TAB(65);:PRINT USING"$$######,###";SASSET.L
3680 PRINT:PRINT TAB(1);"TOTAL VALUE OWNED ASSETS";TAB(40);:PRINT USING"$$######
,###";STASSET.CB;:PRINT TAB(65);:PRINT USING"$$######,###";STASSETS.M
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3690 PRINT:PRINT TAB(1);"VALUE OF RENTED LAND (acres=";INT(TAR);")";TAB(47);"N/A
";TAB(65);:PRINT USING"$$######,###";ASSET.LRT
3700 PRINT:PRINT TAB(1);"TOTAL VALUE OF RENTED & OWNED ASSETS";TAB(40);:PRINT US
ING"$$######,###";(STASSET.CB);:PRINT TAB(65);:PRINT USING"$$######,###";(ASSET.
LRT+STASSETS.M)
3710 REM PRINT"TO CONTINUE PRESS < C >"
3712 LOCATE 24,28:PRINT "To Continue Press < C >";
3720 IF INKEY$ < > "C" THEN 3720
3730 CLS
3740 PRINT TAB(1);"BALANCE SHEET AFTER FINANCIAL DECISIONS-JANUARY 1,";TAB(52);:
PRINT USING "####";YEAR;:PRINT TAB(60);"PAGE 2"
3750 PRINT TAB(1);"LIABILITIES AND NET WORTH";TAB(40);"MODIFIED COST";TAB(65);"M
ARKET VALUE"
3760 PRINT TAB(1);"CURRENT LIABILITIES"
3770 PRINT TAB(3);"- Operating loan (12 mo or less)";TAB(40);:PRINT USING"$$####
##,###";SDBT.C;:PRINT TAB(65);:PRINT USING"$$######,###";SDBT.C
3780 PRINT TAB(3);"- Current Port. Inter. Debt";TAB(40);:PRINT USING"$$######,##
#";SCP.I;:PRINT TAB(65);:PRINT USING"$$######,###";SCP.I
3790 PRINT TAB(3);"- Current Port. Long-Term Debt";TAB(40);:PRINT USING"$$######
,###";SCP.L;:PRINT TAB(65);:PRINT USING"$$######,###";SCP.L
3800 PRINT TAB(3);"- Land Lease Payable";TAB(40);:PRINT USING"$$######,###";SLEA
PAY.C;:PRINT TAB(65);:PRINT USING"$$######,###";SLEAPAY.C
3810 PRINT TAB(1);"TOTAL CURRENT LIABILITIES";TAB(40);:PRINT USING"$$######,###"
;STDBT.C;:PRINT TAB(65);:PRINT USING"$$######,###";STDBT.C
3820 PRINT:PRINT TAB(1);"INTERMEDIATE LIABILITIES"
3830 PRINT TAB(3);"- Machinery/Bldg Loan";TAB(40);:PRINT USING"$$######,###";SLP
DBT.I;:PRINT TAB(65);:PRINT USING"$$######,###";SLPDBT.I
3840 PRINT TAB(3);"- Contingent Tax on Inter. Assets";TAB(47);"N/A";TAB(65);:PRI
NT USING"$$######,###";SCCGT.I
3850 PRINT TAB(1);"TOTAL INTERMEDIATE LIABILITIES";TAB(40);:PRINT USING"$$######
,###";SLPDBT.I;:PRINT TAB(65);:PRINT USING"$$######,###";STDBT.I
3860 PRINT:PRINT TAB(1);"LONG-TERM LIABILITIES"
3870 PRINT TAB(3);"- Real Estate Mortgage";TAB(40);:PRINT USING"$$######,###";SL
PDBT.L;:PRINT TAB(65);:PRINT USING"$$######,###";SLPDBT.L
3880 PRINT TAB(3);"- Contingent Tax on Land";TAB(47);"N/A";TAB(65);:PRINT USING"
$$######,###";SCCGT.L
3890 PRINT TAB(1);"TOTAL LONG-TERM LIABILITIES";TAB(40);:PRINT USING"$$######,##
#";SLPDBT.L;:PRINT TAB(65);:PRINT USING"$$######,###";STDBT.L
3900 PRINT:PRINT TAB(1);"TOTAL LIABILITIES";TAB(40);:PRINT USING"$$######,###";S
TDBT.CB;:PRINT TAB(65);:PRINT USING"$$######,###";STDBT.M
3910 PRINT:PRINT TAB(1);"NET WORTH";TAB(40);:PRINT USING"$$######,###";STEQTPOS.
CB;:PRINT TAB(65);:PRINT USING"$$######,###";STEQTPOS.M
3920 REM PRINT"TO CONTINUE PRESS < C >"
3922 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:L
OCATE 20,15: PRINT S39$;S20$
3924 IF A$="c" OR A$="C" THEN GOTO 3940:ELSE GOTO 3925
3925 IF A$="B" OR A$="b" THEN GOTO 3530:ELSE 3922
3930 REM IF INKEY$ < > "C" THEN 3930
3940 CLS
3950 PRINT TAB(1);"BALANCE SHEET AFTER FINANCIAL DECISIONS-JANUARY 1,";TAB(52);:
PRINT USING "####";YEAR;:PRINT TAB(60);"PAGE 3"
3960 PRINT : PRINT : PRINT TAB(23);"CREDIT RESERVE SUMMARY INFORMATION":PRINT:PR
INT:PRINT
3970 PRINT USING "       MAXER.W        $$######,###                MAXEM.W
 $$######,###";MAXER.W;MAXEM.W:PRINT
3980 PRINT:PRINT USING "       CRDRESR.C      $$######,###                CRDRESM.
C      $$######,###";SCRDRESR.C;SCRDRESM.C
3990 PRINT:PRINT USING "       CRDRESR.I      $$######,###                CRDRESM.
I      $$######,###";SCRDRESR.I;SCRDRESM.I
4000 PRINT:PRINT USING "       CRDRESR.L      $$######,###                CRDRESM.
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```
L      $$######,###";SCRDRESR.L;SCRDRESM.L
4010 PRINT:PRINT:PRINT USING "      CRDRESR.W      $$######,###                CR
DRESM.W      $$######,###";CRDRESR.W;CRDRESM.W
4015 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:L
OCATE 20,15:PRINT S39$;S20$
4016 IF A$="C" OR A$="c" THEN GOTO 4040:ELSE GOTO 4017
4017 IF A$="B" OR A$="b" THEN GOTO 3730:ELSE GOTO 4015
4020 REM LOCATE 23,30:PRINT "PRESS < C > TO CONTINUE"
4030 REM IF INKEY$ < > "C" THEN 4030
4040 RETURN
```

```
10 REM ***************          MODULE No.5          ***************
20 REM *************** DATE LAST UPDATED 12/02/88 ***************
30 REM *************** DATE LAST PRINTED 12/02/88 ***************
40 REM *************** TIME LAST PRINTED 05:45 PM ***************
50 REM $INCLUDE: 'MODCOM'
170 GOSUB   260:REM   RI & EI TEMP ACCOUNTS
180 GOSUB  560 :REM   RI & EI CALCULATIONS
185 REM    970 :REM   CALCULATION OF CROP GROSS MARGINS
190 REM   1450 :REM   TAX EQUATIONS
200 REM   1720 :REM   CASHFLOW EQUATIONS
210 GOSUB 2150 :REM   EVALUATION OF NET CASH FLOW W/REFINANCE OPTION
220 GOSUB 2370 :REM   BALANCE SHEET EQUATIONS
230 GOSUB 3480 :REM   BANKRUPTCY ROUTINE
240 GOSUB 4050 :REM   CREDIT RESERVE CHECKS
250 GOSUB 3510 :REM   BALANCE SHEET FORMAT
260 REM TEMP ACCOUNTS NEEDED FOR RI/EI CALC
270 TOTA=AO+AR
280 TOTACRN=TOTA*CAP/100
290 TOTASYB=TOTA*SAP/100
300 SUMCCVE=0:SUMSCVE=0:TEMPCCVE(C,2)=CCVE(C,2):TEMPSCVE(S,2)=SCVE(S,2)
301 REM MACHINERY REPAIRS PER ACRE ADJUSTED FOR LEVEL OF INVESTMENT GAMMA1S
302 REPFAC.C=AVEGAMMA*CCVE(C,2):REPFAC.S=AVEGAMMA*SCVE(S,2)
304 CCVE(C,2)=REPFAC.C/GAMMA1S:SCVE(S,2)=REPFAC.S/GAMMA1S
310 IF TOTA<100 THEN NACRES=1:ELSE IF TOTA<180 THEN NACRES=2:ELSE IF TOTA<260 TH
EN NACRES=3:ELSE IF TOTA<500 THEN NACRES=4:ELSE IF TOTA<1000 THEN NACRES=5:ELSE
NACRES=6
320 FOR I=1 TO 12
330 IF I>2 AND I<6 THEN CCVE(C,I)=CCVE(C,I)*(1-DISFAC(I,NACRES)):SCVE(S,I)=SCVE(
S,I)*(1-DISFAC(I,NACRES))
340 SUMCCVE=SUMCCVE+CCVE(C,I):SUMSCVE=SUMSCVE+SCVE(S,I)
350 NEXT I
360 TAXPA=CFE(2)/AO
370 INSPA=CFE(4)/TOTA
380 IF ASSET.LR=0 AND VOLLIQU.LR=0 GOTO 420
385 IF ASSET.LR=0 AND VOLLIQU.LR>0 GOTO 400
390 IF ASSET.LR>0 AND VOLLIQU.LR=0 GOTO 410
400 TCFE(1)=CFE(1)-((VOLLIQU.LR/PPRA)*RRPA):GOTO 425
410 TCFE(1)=CFE(1)+(ASSET.LR/PPRA*RRPA):GOTO 425
420 TCFE(1)=CFE(1):GOTO 425
425 IF ASSETP.LO=0 AND VOLLIQU.LI=0 GOTO 470
426 IF ASSETP.LO=0 AND VOLLIQU.LI>0 GOTO 475
427 IF ASSETP.LO>0 AND VOLLIQU.LI=0 GOTO 480
470 TCFE(2)=CFE(2):GOTO 520
475 TCFE(2)=CFE(2)-TAXPA*(VOLLIQU.LO/(SASSET.L/AO)):GOTO 525
480 TCFE(2)=CFE(2)+TAXPA*(ASSETP.LO/PPPA):GOTO 526
520 TCFE(4)=CFE(4):GOTO 530
525 TCFE(4)=CFE(4)-INSPA*((VOLLIQU.LR/PPRA)-(VOLLIQU.LO/(SASSET.L/AO))):GOTO 530
526 TCFE(4)=CFE(4)+INSPA*((ASSET.LR/PPRA)+(ASSETP.LO/PPPA)):GOTO 530
530 TSUMCFE=CFE(3)+CFE(5)+TCFE(1)+TCFE(2)+TCFE(4)
540 OPIN.C=(SUMCCVE + PREMC +((TSUMCFE*(CAP/100))/TOTACRN))*(IN.C*.5)
550 OPIN.S=(SUMSCVE + PREMS + ((TSUMCFE*(SAP/100))/TOTASYB))*(IN.C*.5)
555 RETURN
560 REM CALCULATE Ri AND Ei FOR "ACTUAL" CASHFLOW
570 CLS:LOCATE 14,16:PRINT "Calculating The Firm's Simulated Cash Flow For: ";YE
AR:PRINT
600 REM SUBROUTINE TO CALCULATE RANDOM NORMAL VARIATES
605 TIM=VAL(RIGHT$(TIME$,2))
```

```
610 SDPRC=EPC*.102:SDPRS=EPS*6.800001E-02
615 RANDOMIZE TIM
620 REM SUBROUTINE TO CALCULATE RANDOM NORMAL VARIATES
630 SDC=.25*TMCC
640 SDS=.25*TMCS
650 FOR I=1 TO 2
660 SM=0
670 FOR KK=1 TO 12
690 R=RND(1)
700 SM=SM+R
710 NEXT KK
720 VO=SM-6
725 IF VO > 2 THEN VO=2
730 RV(I)=VO
740 IF I=1 THEN STOYC=SDC*RV(I)+TYLDC*1.15*(1-LN^(-8.25*GAMMA1S)) ELSE STOYS=SDS
*(CC1*RV(I-1)+((1-CC1*CC1)^.5)*RV(I))+TYLDS*1.15*(1-LN^(-8.25*GAMMA1S)):REM REPL
ACED TMCC AND TMCS WITH YLDC AND YLDS
750 NEXT I
760 REM COMPUTE TQC AND TQS
770 IF STOYC<GYC THEN TQC=TOTACRN*GYC:ELSE TQC=TOTACRN*STOYC
780 IF STOYS<GYS THEN TQS=TOTASYB*GYS:ELSE TQS=TOTASYB*STOYS
790 REM GENERATE STOCHASTIC PRICES
800 FOR I=1 TO 2
810 SM=0
820 FOR KK=1 TO 12
840 R=RND(1)
850 SM=SM+R
860 NEXT KK
870 VO=SM-6
880 RV(I)=VO
890 IF I=1 THEN STOPC=SDPRC*RV(I)+EPC ELSE STOPS=SDPRS*(CC2*RV(I-1)+((1-CC2*CC2)
^.5)*RV(I))+EPS
900 NEXT I
905 IF STOYC < 0 THEN STOYC=0:IF STOYS < 0 THEN STOYS=0
910 IF STOYC < GYC AND STOPC<IPC THEN STOPC=IPC
920 IF STOYS < GYS AND STOPS<IPS THEN STOPS=IPS
925 REM CALCULATING CASH FLOW EXPOSURE POSITIONS WITH AND WITHOUT ALL-RISK INSUR
ANCE
930 CFXPC=((EPC*(GYC-1))+IPC*1-SUMCCVE-PREMC)*TOTACRN-(TSUMCFE*CAP/100)-(DBT.C*I
N.C*CAP/100)-(DBT.I*IN.I*CAP/100)-(DBT.L*IN.L*CAP/100)-OPIN.C*TOTACRN
940 CFXPS=((EPS*(GYS-1))+IPS*1-SUMSCVE-PREMS)*TOTASYB-(TSUMCFE*SAP/100)-(DBT.C*I
N.C*SAP/100)-(DBT.I*IN.I*SAP/100)-(DBT.L*IN.L*SAP/100)-OPIN.S*TOTASYB
950 NOINSRC=-(SUMCCVE*TOTACRN*.45)-(TSUMCFE*CAP/100)-(DBT.I*IN.I*CAP/100)-(DBT.L
*IN.L*CAP/100)-(DBT.C*IN.C*CAP/100)-(OPIN.C*TOTACRN)
960 NOINSRS=-(SUMSCVE*TOTASYB*.65)-(TSUMCFE*SAP/100)-(DBT.I*IN.I*SAP/100)-(DBT.L
*IN.L*SAP/100)-(DBT.C*IN.C*SAP/100)-(OPIN.S*TOTASYB)
970 REM COMPUTE GROSS RECEIPTS FOR CORN
980 IF TQC>QCC THEN GRC=QCC*EPC+STOPC*(TQC-QCC):ELSE GRC=QCC*EPC
990 REM COMPUTE THE GROSS MARGIN FOR CORN
1000 IF TQC > QCC AND STOYC > BEHYC AND STOYC > GYC THEN GOTO 1080
1010 IF TQC > QCC AND STOYC > BEHYC AND STOYC < GYC THEN GOTO 1130
1020 IF TQC > QCC AND STOYC < BEHYC AND STOYC > GYC THEN GOTO 1110
1030 IF TQC > QCC AND STOYC < BEHYC AND STOYC < GYC THEN GOTO 1140
1040 IF TQC < QCC AND STOYC > BEHYC AND STOYC > GYC THEN GOTO 1090
1050 IF TQC < QCC AND STOYC > BEHYC AND STOYC < GYC THEN GOTO 1100
1060 IF TQC < QCC AND STOYC < BEHYC AND STOYC > GYC THEN GOTO 1120
1070 IF TQC < QCC AND STOYC < BEHYC AND STOYC < GYC THEN GOTO 1150
1080 GMC=GRC-(SUMCCVE+PREMC+OPIN.C)*TOTACRN:GOTO 1190
1090 GMC=GRC-(SUMCCVE+PREMC+OPIN.C)*TOTACRN-STOPC*(QCC-TQC)*(1+CTCF):GOTO 1190
1100 GMC=GRC-(SUMCCVE+PREMC+OPIN.C)*TOTACRN-STOPC*(QCC-TQC)*(1+CTCF)+IPC*(GYC-ST
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OYC)*TOTACRN:GOTO 1190
1110 GOSUB 1160:GMC=GRC-(GMC1+GMC2):GOTO 1190
1120 GOSUB 1160:GMC=GRC-(CMC1+GMC2)-STOPC*(QCC-TQC)*(1+CTCF):GOTO 1190
1130 GMC=GRC-(SUMCCVE+PREMC+OPIN.C)*TOTACRN+IPC*(GYC-STOYC)*TOTACRN:GOTO 1190
1140 GOSUB 1160:GMC=GRC-(GMC1+GMC2)+IPC*(GYC-STOYC)*TOTACRN:GOTO 1190
1150 GOSUB 1160:GMC=GRC-(GMC1+GMC2)+IPC*(GYC-STOYC)*TOTACRN-STOPC*(QCC-TQC)*(1+C
TCF):GOTO 1190
1160 GMC1=(CCVE(C,3)+CCVE(C,4)+CCVE(C,5)+PREMC)+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+C
CVE(C,8)+CCVE(C,11)+CCVE(C,12))*.25+CCVE(C,9)*.5
1170 GMC2=((CCVE(C,3)+CCVE(C,4)+CCVE(C,5)+PREMC)+(CCVE(C,1)+CCVE(C,2)+CCVE(C,7)+
CCVE(C,8)+CCVE(C,11)+CCVE(C,12))*.25+CCVE(C,9)*.5)*(IN.C*.5)*TTOTACRN
1175 RETURN
1180 REM COMPUTIMG GROSS RECEIPTS FOR SOYBEANS
1190 IF TQS>QCS THEN GRS=QCS*EPS+STOPS*(TQS-QCS):ELSE GRS=QCS*EPS
1200 REM COMPUTE THE GROSS MARGIN FOR SOYBEANS
1210 IF TQS > QCS AND STOYS > BEHYS AND STOYS > GYS THEN GOTO 1290
1220 IF TQS > QCS AND STOYS > BEHYS AND STOYS < GYS THEN GOTO 1340
1230 IF TQS > QCS AND STOYS < BEHYS AND STOYS > GYS THEN GOTO 1320
1240 IF TQS > QCS AND STOYS < BEHYS AND STOYS < GYS THEN GOTO 1350
1250 IF TQS < QCS AND STOYS > BEHYS AND STOYS > GYS THEN GOTO 1300
1260 IF TQS < QCS AND STOYS > BEHYS AND STOYS < GYS THEN GOTO 1310
1270 IF TQS < QCS AND STOYS < BEHYS AND STOYS > GYS THEN GOTO 1330
1280 IF TQS < QCS AND STOYS < BEHYS AND STOYS < GYS THEN GOTO 1360
1290 GMS=GRS-(SUMSCVE+PREMS+OPIN.S)*TOTASYB:GOTO 1400
1300 GMS=GRS-(SUMSCVE+PREMS+OPIN.S)*TOTASYB-STOPS*(QCS-TQS)*(1+STCF):GOTO 1400
1310 GMS=GRS-(SUMSCVE+PREMS+OPIN.S)*TOTASYB-STOPS*(QCS-TQS)*(1+STCF)+IPS*(GYS-ST
OYS)*TTOTASYB:GOTO 1400
1320 GOSUB 1370:GMS=GRS-(GMS1+GMS2):GOTO 1400
1330 GOSUB 1370:GMS=GRS-(GMS1+GMS2)-STOPS*(QCS-TQS)*(1+STCF):GOTO 1400
1340 GMS=GRS-(SUMSCVE+PREMS+OPIN.S)*TOTASYB+IPS*(GYS-STOYS)*TOTASYB:GOTO 1400
1350 GOSUB 1370:GMS=GRS-(GMS1+GMS2)+IPS*(GYS-STOYS)*TOTASYB:GOTO 1400
1360 GOSUB 1370:GMS=GRS-(GMS1+GMS2)+IPS*(GYS-STOYS)*TOTASYB-STOPS*(QCS-TQS)*(1+S
TCF):GOTO 1400
1370 GMS1=(SCVE(S,3)+SCVE(S,4)+SCVE(S,5)+PREMS)+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+S
CVE(S,8)+SCVE(S,11)+SCVE(S,12))*.25+SCVE(S,9)*.5
1380 GMS2=((SCVE(S,3)+SCVE(S,4)+SCVE(S,5)+PREMS)+(SCVE(S,1)+SCVE(S,2)+SCVE(S,7)+
SCVE(S,8)+SCVE(S,11)+SCVE(S,12))*.25+SCVE(S,9)*.5)*(IN.C*.5)*TOTASYB
1385 RETURN
1390 REM COMPUTE TOTAL GROSS MARGIN
1400 TOTGM=GMC+GMS
1405 AVEGMPA=TOTGM/(TOTACRN+TOTASYB)
1410 GMSPA=GMS/TOTASYB:GMCPA=GMC/TOTACRN
1412 REM CALCULATE INTEREST PMTS FOR CURRENT YEAR
1413 TINDBT.I=INDBT.I:TINDBT.L=INDBT.L:TINDBT.C=INDBT.C
1415 REM COMPUTE NET INCOME BEFORE TAX
1419 TROWCOST=ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I)+ROW.L*(VOLLIQ
MIN.L+VOLLIQMIN.IL)+IROWCOST
1421 RTROWCOST=ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I)+ROW.L*(VOLLI
QMIN.L+VOLLIQMIN.IL)
1423 REM CALCULATING ALL RISK CROP INSURANCE PMTS
1424 IF GYC > 0 AND STOYC < GYC THEN INSPMTC=IPC*(GYC-STOYC)*TOTACRN: ELSE INSPM
TC=0
1426 IF GYS > 0 AND STOYS < GYS THEN INSPMTS=IPS*(GYS-STOYS)*TOTASYB: ELSE INSPM
TS=0
1430 REM CALCULATE DEPRECIATION AS INTEGAR VALUE
1440 CYRDEPREC=INT(MEBV-(MEBV/(1+DEPRATE)))
1450 REM CALCULATE TXGAIN
1460 ITXGAIN=((TXASSET.L-TXSASSET.L)-(TXCBASET.L-TXSCBASET.L))+((TXASSET.I-TXSAS
SET.I)-(TXMEBV-TXSMEBV))
1465 IF ITXGAIN <= 0 AND ITAXGAIN > -100 THEN TXGAIN=0:ELSE TXGAIN=ITXGAIN
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1468 OPLABOR=2080*(6.6*CUMINFLA(CYCLE))
1469 REM INSURANCE PMTS NOT TAXABLE
1471 NIBT=TOTGM-TSUMCFE-CYRDEPREC-CYRINDBT.C-CYRINDBT.I-CYRINDBT.L+OPLABOR-TROWC
OST+TXGAIN-REFINCOST-INSPMTC-INSPMTS
1472 TNIBT=NIBT
1475 TINTEARN=(TASSET.C-MINRATIO.C*TDBT.C)*RFRR:REM RISK FREE RATE OF RETURN ON
CASH RESERVE
1476 IF TINTEARN >0 THEN INTEARN=TINTEARN:ELSE INTEARN=0
1480 ADJINC=NIBT+NONFINC+INTEARN
1490 EXEMP=2000*NUMDEP:REM 1989 FED TAX EXEMPTION AMOUNT
1500 PTAXINC=ADJINC-EXEMP-5000:REM STANDARD FAMILY DEDUCTION $5000
1505 REM CALCULATE TAXINC AND ADJUST ENDING ITC BALANCE
1506 IF PTAXINC > BAITC THEN TAXINC=PTAXINC-BAITC:EAITC=0:GOTO 1510
1507 IF PTAXINC > 0 AND PTAXINC < BAITC THEN TAXINC=0:EAITC=BAITC-PTAXINC:GOTO 1
510
1508 IF PTAXINC < 0 THEN TAXINC=0:EAITC=BAITC
1510 IF TAXINC >= 0 AND TAXINC <=29750 THEN TAX=TAXINC*.15:TAXRATE=.15:GOTO 1560
1520 IF TAXINC >= 29751 AND TAXINC <= 71900! THEN TAX=TAXINC*.28:TAXRATE=.28:GOT
O 1560
1530 IF TAXINC >= 71901! AND TAXINC <= 171090! THEN TAX=TAXINC*.33:TAXRATE=.33:G
OTO 1560
1540 IF TAXINC >= 171091! THEN TAX=TAXINC*.28:TAXRATE=.28
1560 REM CALCULATION OF SELF EMPLOYED SOCIAL SECURITY TAX
1570 IF TAXINC<= 43800! THEN SSTAX=TAXINC*.1302:ELSE SSTAX=5387:REM 13.02 1988 S
ELF EMPLOYED SOCIAL SECURITY TAX RATE
1580 REM CALCULATION OF STATE INCOME TAX PAYMENT
1590 STATETAX=.046*TAXINC
1650 REM CALCULATE AVAILABLE INVESTMENT TAX CREDIT
1655 REM ITC ELIMINATED IN 1986, ITC CARRY FORWARD OK TO USE UNTIL BALANCE IS ZE
RO
1660 REM ITC=0
1670 REM ITC=.1*(ASSETP.IRA+ASSETP.IO+MAXASSETP.IS+ASSETP.IR)
1680 REM BAITC=BAITC+ITC
1700 TOTTAX=INT(TAX+STATETAX+SSTAX)
1710 IF TOTTAX <= 0 THEN TOTTAX =0
1715 REM ADDING INSURANCE PMTS BACK TO AFTER TAX INCOME
1720 NIAT=PTAXINC-TOTTAX+INSPMTC+INSPMTS
1730 REM NRRA=NIAT+INDBT.I+INDBT.L+INDBT.C:REM R/E APPRECIATION NOT INCLUDED IN
RETURN ON TOTAL ASSETS (ASSET.L*REIR(CYCLE)-ASSET.L)
1731 NRRA=TNIBT+CYRINDBT.I+CYRINDBT.L+CYRINDBT.C+INTEARN+NONFINC+INSPMTC+INSPMTS
:REM R/E APPRECIATION NOT INCLUDED IN RETURN ON TOTAL ASSETS (ASSET.L*REIR(CYCLE
)-ASSET.L)
1735 GOSUB 4500:REM UPDATING REAL ESTATE VALUES FOR THE YEAR
1740 RBAR=NRRA/(TASSETS.M+.5*READJUST)
1741 TRBAR=NRRA/TASSET.CB
1750 LOCATE 17,19:PRINT USING "SIMULATED RATE OF RETURN (RBAR) ###.### %";(RBAR*
100)
1810 REM SIMULATING ACTUAL FAMILY LIVING RESULTS FOR THE YEAR
1820 IF NIAT<=MININC THEN AFAMLIVING=MININC
1830 IF NIAT>MININC THEN AFAMLIVING=MININC+61*(NIAT^.5)
1840 IF AFAMLIVING>MAXINC THEN AFAMLIVING=MAXINC
1860 WGTAVFAML=(WGTAVFAML+AFAMLIVING)/2
1865 WTHDRWLS=AFAMLIVING+CASHOUT
1870 REM CALCULATING THE FAMILY LIVING ESTIMATE FOR NEXT CYCLE
1880 EFAMLIVING=ALPHA*AFAMLIVING+(1-ALPHA)*(WGTAVFAML)
1970 REM REDUCING CROPSALE FOR INSURANCE PAYMENTS
1980 CROPSALE=GRC+GRS-INSPMTC-INSPMTS
1985 REM CALCULATION OF OTHER INCOME "OTHINC"
1990 OTHINC=INSPMTC+INSPMTS+INTEARN
1995 REM CALCULATION OF TOTAL ASSETS SOLD
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2005 TASSETLIQ=TOTOPVOLL+VOLLIQMIN.C+VOLLIQMIN.I+VOLLIQMIN.L+VOLLIQMIN.LI+VOLLIQ
MIN.IL
2027 IF FLAG.DECISION=0 AND XMACH<=0 THEN NEWDBT=ASSETP.IR*(1-CASHDP.I):GOTO 204
0:ELSE GOTO 2028
2028 IF FLAG.DECISION=0 AND XMACH>0 THEN NEWDBT=ASSETP.IR*(1-CASHDP.I)+(MAXASSET
P.IS-VOLLIQU.IT)*(1-CASHDP.I):GOTO 2040:ELSE GOTO 2029
2029 IF FLAG.DECISION < > 0 AND FLAG.DECISION < > 2 AND XMACH<0 THEN NEWDBT=ASSE
TP.LO*(1-CASHDP.L)+ASSETP.IR*(1-CASHDP.I):GOTO 2040:ELSE GOTO 2030
2030 IF FLAG.DECISION < > 0 AND FLAG.DECISION < > 2 AND XMACH>0 THEN NEWDBT=ASSE
TP.LO*(1-CASHDP.L)+(ASSETP.IO+ASSETP.IR+ASSETP.IRA+MAXASSETP.IS)*(1-CASHDP.I)-VO
LLIQU.IT*(1-ROW.I):GOTO 2040:ELSE GOTO 2032
2032 IF FLAG.DECISION=2 AND XMACH<0 THEN NEWDBT=ASSETP.IR*(1-CASHDP.I):GOTO 2040
:ELSE GOTO 2033
2033 IF FLAG.DECISION=2 AND XMACH>0 THEN NEWDBT=(ASSETP.IR+MAXASSETP.IS)*(1-CASH
DP.I)
2035 REM CALCULATION OF TOTAL CASH AVAILABLE
2040 TCA=INT(CROPSALE+OTHINC+NONFINC+TASSETLIQ+NEWDBT)
2054 REM ADJUSTING EXPENSES FOR THE SITUATION WHERE TQC<QCC AND/OR TQS<QSC
2055 DQCCEXP=0:DQCSEXP=0
2056 IF TQC<QCC THEN GOTO 2057 ELSE GOTO 2058
2057 DQCCEXP=(QCC-TQC)*(1+CTCF)
2058 IF TQS<QCS THEN GOTO 2059 ELSE GOTO 2080
2059 DQCSEXP=(QCS-TQS)*(1+SRCF)
2080 TCEXP=(SUMCCVE+PREMC+OPIN.C)*TOTACRN+(SUMSCVE+PREMS+OPIN.S)*TOTASYB+TSUMCFE
+REFINCOST+CYRINDBT.C+DQCCEXP+DQCSEXP-OPLABOR
2085 REM CALCULATION OF NON SCHEDULED DEBT RETIREMENT
2086 IF FLAG.DECISION=0 THEN DBTRET=(1-ROW.I)*(VOLLIQMIN.I+VOLLIQMIN.LI)+(1-ROW.
L)*(VOLLIQMIN.L+VOLLIQMIN.IL)+(1-ROW.C)*VOLLIQMIN.C:GOTO 2108:ELSE GOTO 2087
2087 IF FLAG.DECISION=2 THEN DBTRET=(1-ROW.I)*(VOLLIQU.I+ABS(VOLLIQU.IT)+VOLLIQM
IN.I+VOLLIQMIN.LI)+(1-ROW.L)*(VOLLIQU.LO+VOLLIQMIN.L+VOLLIQMIN.IL)+(1-ROW.C)*(VO
LLIQMIN.C)-SNETVOLL.I-SNETVOLL.L:GOTO 2117:ELSE GOTO 2088
2090 IF FLAG.DECISION=1 THEN DBTRET=(1-ROW.I)*(TOTOPVOLL)+(1-ROW.I)*(VOLLIQU.I+V
OLLIQMIN.I+VOLLIQMIN.LI)+(1-ROW.L)*(VOLLIQU.LO+VOLLIQMIN.L+VOLLIQMIN.IL)+(1-ROW.
C)*VOLLIQMIN.C:GOTO 2113
2108 IF FLAG.DECISION=0 AND XMACH<0 THEN CAPINV=ASSETP.IR+MAXASSETP.IS:GOTO 2120
:ELSE 2109
2109 IF FLAG.DECISION=0 AND XMACH>=0 THEN CAPINV=ASSETP.IR+MAXASSETP.IS:GOTO 212
0:ELSE 2113
2113 IF FLAG.DECISION=1 AND XMACH>0 THEN CAPINV=ASSETP.IO+ASSETP.IRA+ASSETP.IR+M
AXASSETP.IS+ASSETP.LO-VOLLIQU.IT:GOTO 2120:ELSE GOTO 2114
2114 IF FLAG.DECISION=1 AND XMACH<0 THEN CAPINV=ASSETP.IR+ASSETP.LO:ELSE GOTO 21
17
2117 IF FLAG.DECISION=2 AND XMACH>0 THEN CAPINV=ASSETP.IR+MAXASSETP.IS:ELSE GOTO
 2118
2118 IF FLAG.DECISION=2 AND XMACH<0 THEN CAPINV=ASSETP.IR
2120 TCR=INT(TCEXP+CYRPIPMT+TOTTAX+DBTRET+CAPINV+WTHDRWLS+TROWCOST+PPDBT.I+PPDBT
.L):REM CYRPIPMT CALCULATED MOD4A L2195
2125 NCF=TCA-TCR:STOP
2145 RETURN
2150 REM EVALUATING THE NET CASH FLOW OUTCOME
2160 REM REDUCE THE DEBT ACCOUNTS FOR PRINCIPAL PAYMENTS
2165 CYRDBT.I=DBT.I:CYRDBT.L=DBT.L
2170 DBT.I=DBT.I-CYRCP.I:DBT.L=DBT.L-CYRCP.L:REM DBT.C=DBT.C-CP.C
2180 IF NCF > 0 THEN GOTO 2185
2181 IF NCF < 0 AND .5*AVAILASS.C >= ABS(NCF) THEN GOTO 2196
2182 IF NCF < 0 AND .5*AVAILASS.C < ABS(NCF) AND MINEQTPOS.C > ABS(NCF) THEN GOT
O 2198
2183 IF NCF < 0 AND .5*AVAILASS.C < ABS(NCF) AND MINEQTPOS.C < ABS(NCF) THEN GOT
O 2220:REM EVALUATE POSSIBLE REFINANCING LONG TERM
2185 REM 2186-2189 ALTERNATIVES FOR DISTRIBUTING POSITIVE NCF
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2186 VDBT.C = .5*(DBT.C-LEAPAY.C):VNCF =.5*NCF
2187 IF VDBT.C > 0 AND VNCF >= VDBT.C THEN GOTO 2190
2188 IF VDBT.C > 0 AND VDBT.C >= VNCF THEN GOTO 2192
2189 IF VDBT.C = 0 THEN GOTO 2194
2190 ASSET.C = ASSET.C + (NCF-VDBT.C):DBT.C = DBT.C-LEAPAY.C-VDBT.C:GOTO 2370: R
EM BALANCE SHEET UPDATE
2192 ASSET.C = ASSET.C + (NCF-VNCF):DBT.C=DBT.C-LEAPAY.C-VNCF:GOTO 2370: REM BAL
ANCE SHEET UPDATE
2194 ASSET.C = ASSET.C+NCF:GOTO 2370:REM BALANCE SHEET UPDATE
2196 ASSET.C=ASSET.C-ABS(NCF):DBT.C=DBT.C-LEAPAY.C:GOTO 2370:REM BALANCE SHEET U
PDATE
2198 ASSET.C=ASSET.C:DBT.C=DBT.C-LEAPAY.C+ABS(NCF): GOTO 2370:REM BALANCE SHEET
UPDATE
2220 REM TEST FOR POSSIBLE REFINANCING DEFICIT NCF WITH LONG TERM DEBT
2230 IF REFINANCE$="Y" OR REFINANCE$="y" THEN 2270:REM FORCED ASSET LIQUIDATION
2240 IF (REFINANCE$="N" OR REFINANCE$="n") AND  CRDRESR.L > (ABS(NCF)+(DBT.C-LEA
PAY.C)+(500+.05*(ABS(NCF)+(DBT.C-LEAPAY.C))) THEN GOTO 2243:ELSE GOTO 2241
2241 IF (REFINANCE$="N" OR REFINANCE$="n") AND  CRDRESR.L > (ABS(NCF)+.5*(DBT.C-
LEAPAY.C)+(500+.05*(ABS(NCF)+.5*(DBT.C-LEAPAY.C))) THEN GOTO 2244:ELSE GOTO 224
2
2242 IF (REFINANCE$="N" OR REFINANCE$="n") AND  CRDRESR.L > (ABS(NCF)+500+.05*AB
S(NCF)) THEN GOTO 2245:ELSE GOTO 2246
2243 DBT.L=DBT.L+ABS(NCF)+(DBT.C-LEAPAY.C)+500+.05*(ABS(NCF)+(DBT.C-LEAPAY.C)):D
BT.C=0:LEAPAY.C=0:REFINCOST=((ABS(NCF)+(DBT.C-LEAPAY.C))*.05+500):GOTO 2250:REM
ADJUST NCF
2244 DBT.L=DBT.L+ABS(NCF)+.5*(DBT.C-LEAPAY.C)+500+.05*(ABS(NCF)+.5*(DBT.C-LEAPAY
.C)):DBT.C=DBT.C-LEAPAY.C-.5*(DBT.C-LEAPAY.C):LEAPAY.C=0:REFINCOST=((ABS(NCF)+.5
*(DBT.C-LEAPAY.C))*.05+500):GOTO 2250:REM ADJUST NCF
2245 DBT.L=DBT.L+ABS(NCF)+500+.05*ABS(NCF):REFINCOST=(ABS(NCF)*.05+500):GOTO 225
0:REM ADJUST NCF
2246 IF (REFINANCE$="N" OR REFINANCE$="n") AND  CRDRESR.L < (ABS(NCF)+500+.05*AB
S(NCF)) THEN ADJCFD=(ABS(NCF)-(.75*CRDRESR.L-(.75*CRDRESR.L*.05)+500))
2247 DBT.L=DBT.L+.75*CRDRESR.L:REFINCOST=(.75*CRDRESR.L*.05+500):GOTO 2280
2250 REM CALCULATING AN ADJUSTED NCF TO INCLUDE REFINANCING
2251 RTCA=INT(CROPSALE+OTHINC+NONFINC+TASSETLIQ+NEWDBT+(DBT.L-RLPDBT.L))
2252 RTCR=INT(TCEXP+CYRPIPMT+TOTTAX+DBTRET+CAPINV+WTHDRWLS+TROWCOST+PPDBT.I+PPDB
T.L+REFINCOST)
2253 RNCF=RTCA-RTCR
2254 IF RNCF > 0 THEN ASSET.C=ASSET.C+RNCF:GOTO 2260:ELSE RNCF=0:GOTO 2260
2260 GOTO 2370:REM UPDATE BALANCE SHEET
2265 REM CALCULATION OF FORCED ASSET LIQUIDATION
2270 IF REFINANCE$= "Y" OR REFINANCE$= "y" AND CRDRESR.C < ABS(NCF) THEN ADJCFD=
ABS(NCF): REM FINANCE ADJCFD WITH FORCED LIQUIDATION OF ASSETS
2280 PRINT "GOING INTO FORCED ASSET LIQUIDATION"
2285 FDE.I=(CYRDBT.I-CYRCP.I)/(EQTPOS.I+CYRCP.I-CYRDEPREC)
2290 FORLIQ.I=((ADJCFD*GAMMA1S)/(1-ROW.I))*((.9000001+FDE.I*((1/(1-ROW.I))^FDE.I
))/(1-ROW.I))
2300 FDBT.I=CYRDBT.I-CYRCP.I-(FORLIQ.I-(ROW.I*FORLIQ.I)-(ADJCFD)*GAMMA1S)
2301 FASSET.I=ASSET.I-FORLIQ.I:FORLIQDBT.I=(FORLIQ.I-(ROW.I*FORLIQ.I)-ADJCFD*GAM
MA1S)
2320 FDE.L=(CYRDBT.L-CYRCP.L)/(EQTPOS.L+CYRCP.L)
2330 FORLIQ.L=((ADJCFD*(1-GAMMA1S))/(1-ROW.L))*(.9000001+FDE.L*((1/(1-ROW.L))^FD
E.L)/(1-ROW.L))
2342 FDBT.L=CYRDBT.L-CYRCP.L-(FORLIQ.L-(ROW.L*FORLIQ.L)-ADJCFD*(1-GAMMA1S))
2344 FASSET.L=ASSET.L-FORLIQ.L:FORLIQDBT.L=(FORLIQ.L-(ROW.L*FORLIQ.L)-ADJCFD*(1-
GAMMA1S))
2345 IF FASSET.L*(1-ROW.L) > FDBT.L THEN GOTO 2370:ELSE GOTO 2351
2351 PRINT "REQUIRED FORCED LAND SALE IS GREATER THAN MARKET VALUE OF OWNED LAND
--- YOUR FARM WILL BE GOING BANKRUPT!!!!!!":GOTO 2370
2352 REM ESTIMATION OF TAX GAIN FROM FORLIQ.L
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2354 REM TGFORLIQ.L=FORLIQ.L-(CBASET.L/ASSET.L)*FORLIQ.L
2355 PRINT "COMING OUT OF FORCED ASSET CALCULATION"
2360 GOTO 2370:RETURN
2370 REM BALANCE SHEET UPDATE EQUATIONS (CURRENT, INTERMEDIATE, REAL ESTATE)
2380 REM REAL ESTATE ACCOUNTS UPDATE
2390 REM TEMASSET.L=ASSET.L*REIR(CYCLE)
2391 TEMASSET.L=ASSET.L
2400 REM UPDATE THE CBASET.L ACCOUNT
2405 LPRINT "ASSETP.L(PAR),REIR(CYCLE)",ASSETP.L(PAR);REIR(CYCLE);PAR;CYCLE
2406 LPRINT "TVOLLIQMIN.L,TVOLLIQMIN.IL";TVOLLIQMIN.L,TVOLLIQMIN.IL
2407 LPRINT "FORLIQ.L,LIGSHT,VOLLRES";FORLIQ.L,LIGSHT,VOLLRES
2410 VOLLCB.L=(TVOLLIQMIN.L+TVOLLIQMIN.IL+FORLIQ.L+LIQSHT+VOLLRES)/(ASSETP.L(PAR
))
2420 IF VOLLCB.L=0 THEN GOTO 2460
2430 IF VOLLCB.L>1 THEN 2630
2440 SUMRED=SUMRED+VOLLCB.L
2450 IF SUMRED>=1 THEN GOTO 2520:REM CALCULATE LIQSHT
2460 REM UPDATE THE CBASET.L ACCOUNT
2470 CBASE.L(PAR)=CBASE.L(PAR)*(1-SUMRED)
2480 SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
2490 ASSETP.L(PAR)=ASSETP.L(PAR)*(1-SUMRED)
2500 SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
2510 GOTO 2720:REM CONTINUE REAL ESTATE UPDATE CALCULATIONS
2520 REM CALCULATE LIQSHT
2530 LIQSHT=(SUMRED-1)*ASSETP.L(PAR)
2540 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
2550 REM SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
2560 REM SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
2570 REM BANKRUPTCY TEST
2580 PAR=PAR+1
2590 IF PAR>P THEN GOTO 3480 : REM BANKRUPTCY SUBROUTINE
2600 REM GO BACK TO CALC NEW VOLLCB.L
2610 GOTO 2410
2620 REM ROUTINE FOR VOLLCB.L>1
2630 REM CALCULATE VOLLRES
2640 VOLLRES=(TVOLLIQMIN.L+TVOLLIQMIN.IL)-ASSETP.L(PAR)
2650 CBASE.L(PAR)=0:ASSETP.L(PAR)=0:SUMRED=0
2660 REM SUM=0:FOR I=1 TO P:SUM=SUM+CBASE.L(I):NEXT I:CBASET.L=SUM
2670 REM SUM=0:FOR I=1 TO P:SUM=SUM+ASSETP.L(I):NEXT I:ASSET.L=SUM
2680 PAR=PAR+1
2690 IF PAR>P THEN GOTO 3480:REM BANKRUPTCY ROUTINE
2700 REM CALCULATE NEW VOLLCB.L
2710 GOTO 2410 : REM RECALC VOLLCB.L
2720 CCGT.L=(ASSET.L-CBASET.L)*TAXRATE
2725 IF CCGT.L < 0 THEN CCGT.L=0
2730 DBT.L=DBT.L-(1-ROW.L)*TVOLLIQMIN.L-(1-ROW.L)*TVOLLIQU.L-(TVOLLIQMIN.IL-(ROW
.L*TVOLLIQMIN.IL)-TVOLLIQI.L)-FORLIQDBT.L
2740 CP.L=(1/TERM.L)*DBT.L
2750 LPDBT.L=DBT.L-CP.L
2760 TDBT.L=LPDBT.L+CCGT.L
2770 EQTPOS.L=ASSET.L-DBT.L
2780 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
2790 DE.L=DBT.L/EQTPOS.L
2800 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
2810 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
2815 AO=AO-(FORLIQ.L/PPPA)-(TVOLLIQMIN.L/PPPA)-(TVOLLIQMIN.IL/PPPA)
2820 PPPA=TEMASSET.L/AO
2830 REM UPDATING VALUE OF RENTAL ACREAGE
2835 IF AO=0 THEN PPRA=20*RRPA*(1+RRCR):ELSE PPRA=PPPA
2840 IF AO=0 THEN ASSET.PLR=AR*20*RRPA:ELSE ASSET.PLR=AR*PPPA
```

```
2860 REM MACHINERY ACCOUNTS UPDATE
2871 MEBV=IMEBV-CYRDEPREC-((IMEBV/IMECB)*(IMEMV/IMECB)*(TVOLLIQMIN.I+FORLIQ.I+TV
OLLIQMIN.LI))
2881 ASSET.I=IASSET.I-CYRDEPREC-TVOLLIQMIN.I-FORLIQ.I-TVOLLIQMIN.LI
2890 MEMV=ASSET.I
2900 MECB=MECB-(CBMV)*(TVOLLIQMIN.I+FORLIQ.I+TVOLLIQMIN.LI)
2910 ACCDEP=MECB-MEBV
2920 CCGT.I=(ASSET.I-MEBV)*TAXRATE
2925 IF CCGT.I < 0 THEN CCGT.I=0:ELSE CCGT.I=CCGT.I
2930 DBT.I=DBT.I-(1-ROW.I)*TVOLLIQMIN.I-(TVOLLIQMIN.LI-(ROW.I)*TVOLLIQMIN.LI-TVO
LLIQI.I)-FORLIQDBT.I
2940 CP.I=(1/TERM.I)*DBT.I
2950 LPDBT.I=DBT.I-CP.I
2960 TDBT.I=LPDBT.I+CCGT.I
2970 EQTPOS.I=ASSET.I-DBT.I
2980 EQTPOSM.I=ASSET.I-(DBT.I+CCGT.I)
2990 CRDRESR.I=((1-ROW.I)*(1-DEL.I)/ROW.I)*EQTPOS.I-DBT.I
3000 CRDRESM.I=((1-ROW.I)/ROW.I)*EQTPOSM.I-(DBT.I+CCGT.I)
3005 DE.I=DBT.I/EQTPOS.I
3010 REM CURRENT ASSET ACCOUNTS
3055 PPDLEASE=0
3060 TASSET.C=ASSET.C+PPDLEASE
3065 LEAPAY.C=0
3070 DBT.C=DBT.C-LEAPAY.C
3080 TDBT.C=DBT.C+CP.I+CP.L+LEAPAY.C
3090 EQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)
3100 AEQTPOS.C=TASSET.C-(DBT.C+LEAPAY.C)*MINRATIO.C
3110 EQTPOSM.C=TASSET.C-(DBT.C+LEAPAY.C)
3120 MINEQTPOS.C=(TDBT.C+MINCR.C)/((1-ROW.C)*(1-DEL.C)/ROW.C)
3130 TCRDRESR.C=CRDRESR.C
3140 CRDRESR.C=((1-ROW.C)*(1-DEL.C)/ROW.C)*EQTPOS.C-(DBT.C+LEAPAY.C)
3150 CRDRESM.C=((1-ROW.C)/ROW.C)*EQTPOSM.C-(DBT.C+LEAPAY.C)
3160 AVAILASS.CI=AEQTPOS.C-MINEQTPOS.C
3170 AVAILASS.C=AEQTPOS.C-MINEQTPOS.C
3175 LEAPAY.C=0:PPDLEASE=0:REM DUPLICATIVE SEE 3055,3065
3180 REM OTHER MISC. BALANCE SHEET EQUATIONS
3190 TASSET.CB=TASSET.C+MEBV+CBASET.L
3200 TASSETS.M=TASSET.C+ASSET.I+ASSET.L
3220 TDBT.CB=TDBT.C+LPDBT.I+LPDBT.L
3240 TDBT.M=TDBT.C+TDBT.I+TDBT.L
3250 TEQTPOS.CB=TASSET.CB-TDBT.CB
3260 TEQTPOS.M=TASSETS.M-TDBT.M
3270 INDBT.L=DBT.L*IN.L
3280 INDBT.I=DBT.I*IN.I
3290 INDBT.C=DBT.C*IN.C
3300 CURRATIO=TASSET.C/TDBT.C
3310 DE.I=DBT.I/EQTPOS.I
3320 DE.L=DBT.L/EQTPOS.L
3330 GAMMA1S=ASSET.I/(ASSET.L+ASSET.PLR)
3340 ROW.WE0=((ROW.I*GAMMA1S+ROW.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(ROW.I*GAMMA1S*ASSET.LRT+ROW.C*TASSET.C)/(TASSETS.M)
3350 DEL.WE0=((DEL.I*GAMMA1S+DEL.L)*((TASSETS.M)-TASSET.C-GAMMA1S*ASSET.LRT))/((
1+GAMMA1S)*(TASSETS.M))+(DEL.I*GAMMA1S*ASSET.LRT+DEL.C*TASSET.C)/(TASSETS.M)
3351 IN.W=(IN.C*DBT.C+IN.I*DBT.I+IN.L*DBT.L)/TDBT.CB
3352 REM CALCULATE E0 AND E1
3353 E0= (((ROW.WE0+IN.W)*TDBT.M-(1-ROW.WE0)*TEQTPOS.M+WITHDLS)/TASSETS.M)-RBAR
3354 E1NUM= ((ROW.WE0+IN.W-IN.W*DEL.WE0*(1-ROW.WE0))*(DBT.C+SLEAPAY.C+DBT.I+DBT.
L)-(1-ROW.WE0-DEL.WE0+ROW.WE0*DEL.WE0)*TEQTPOS.M+WITHDRLS*(1-DEL.WE0*(1-ROW.WE0)
))
3355 E1DEN= (1-DEL.WE0*(1-ROW.WE0))*TASSETS.M
```

```
3356 E1=(E1NUM/E1DEN)-RBAR
3360 REM CRDRESR.W=(((1-ROW.WE0)*(1-DEL.WE0))/ROW.WE0)*(TASSETS.M-DBT.C-LEAPAY.C
-DBT.I-DBT.L)-(DBT.C+LEAPAY.C+DBT.I+DBT.L)
3370 CRDRESR.W=((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0)*TEQTPOS.M-TDBT.M
3380 CRDRESM.W=((1-ROW.WE0)/ROW.WE0)*TEQTPOS.M-TDBT.M
3390 SUMMINCR=MINCR.C+MINCR.I+MINCR.L
3400 MAXER.W=(CRDRESR.W-SUMMINCR)/((1-ROW.WE0)*(1-DEL.WE0)/ROW.WE0+1)
3410 MAXEM.W=(((1-ROW.WE0)*TEQTPOS.M-ROW.WE0*TDBT.M-MAXER.W)-(SUMMINCR/((1-ROW.W
E0)*(1-DEL.WE0)/ROW.WE0+1)))*(1-ROW.WE0)+(SUMMINCR/((1-ROW.WE0)*(1-DEL.WE0)/ROW.
WE0+1))+MAXER.W
3415 PIPMT=CP.I+CP.L+INDBT.I+INDBT.L
3420 REM UPDATE THE LIQUIDATION ACCOUNTS
3430 VOLLIQMIN.C=VOLLIQMIN.C+TVOLLIQMIN.C:VOLLIQMIN.I=VOLLIQMIN.I+TVOLLIQMIN.I:V
OLLIQMIN.L=VOLLIQMIN.L+TVOLLIQMIN.L:VOLLIQI.I=VOLLIQI.I+TVOLLIQI.I:VOLLIQI.L=VOL
LIQI.L+TVOLLIQI.L:VOLLIQMIN.LI=VOLLIQMIN.LI+TVOLLIQMIN.LI
3440 VOLLIQMIN.IL=VOLLIQMIN.IL+TVOLLIQMIN.IL
3450 REM SET YEAR END LIQUIDATION ACCOUNT BALANCES TO ZERO TO PREVENT DOUBLE ACC
OUNTING
3460 TVOLLIQMIN.C=0:TVOLLIQMIN.I=0:TVOLLIQMIN.L=0:TVOLLIQI.I=0:TVOLLIQI.L=0:TVOL
LIQMIN.LI=0:TVOLLIQMIN.IL=0:VOLLIQU.IT=0
3470 RETURN
3480 REM BANKRUPTCY SUBROUTINE
3490 REM IF (1-ROW.WE0)*TASSETS.M <= TDBT.M OR PAR > P THEN TASSET.C=0:ASSET.I=0
:ASSET.L=0:TASSETS.M=0:TDBT.C=0:TDBT.I=0:TDBT.L=0:TDBT.M=0:TEQTPOS.M=0:CLS:LOCAT
E 15,20:PRINT "SORRY, BUT YOU'RE BANKRUPT ! TRY AGAIN ... ":STOP
3491 IF (1-ROW.WE0)*TASSETS.M <= TDBT.M OR PAR > P THEN PRINT "SORRY BUT YOU'RE
BUSTED !":FOR I= 1 TO 1500:NEXT
3500 RETURN
3510 REM END OF YEAR BALANCE SHEET OUTPUT SUBROUTINE
3520 CLS:KEY OFF
3540 PRINT TAB(1);"YEAR END BALANCE SHEET: DECEMBER 31,";TAB(38);:PRINT USING "#
###";YEAR;:PRINT TAB(50);"PAGE 1"
3550 PRINT TAB(1);"ASSETS";TAB(40);"MODIFIED COST";TAB(65);"MARKET VALUE":PRINT
3560 PRINT TAB(1);"CURRENT ASSETS"
3570 PRINT TAB(3);"- Cash / Cash Equivalent";TAB(40);:PRINT USING "$$######,###"
;ASSET.C;:PRINT TAB(65);:PRINT USING "$$######,###";ASSET.C
3580 PRINT TAB(3);"- Prepaid Land Lease";TAB(40);:PRINT USING"$$######,###";PPDL
EASE;:PRINT TAB(65);:PRINT USING "$$######,###";PPDLEASE
3590 PRINT TAB(1);"TOTAL CURRENT ASSETS";TAB(40);:PRINT USING "$$######,###";TAS
SET.C;:PRINT TAB(65);:PRINT USING "$$######,###";TASSET.C
3600 PRINT:PRINT TAB(1);"INTERMEDIATE ASSETS"
3610 PRINT TAB(3);"- Machinery and Bldg"
3620 PRINT TAB(8);"- Cost";TAB(30);:PRINT USING "$$######,###";MECB;:PRINT TAB(6
5);:PRINT USING "$$######,###";ASSET.I
3630 PRINT TAB(8);"- Acc. Dep.";TAB(30);:PRINT USING "$$######,###";ACCDEP
3640 PRINT TAB(8);"- Book Value";TAB(40);:PRINT USING "$$######,###";MEBV
3650 PRINT TAB(1);"TOTAL INTERMEDIATE ASSETS";TAB(40);:PRINT USING "$$######,###
";MEBV;:PRINT TAB(65);: PRINT USING "$$######,###";ASSET.I
3660 PRINT:PRINT TAB(1);"LAND (acres: own=";INT(AO);")";TAB(40);:PRINT USING"$$#
#####,###";CBASET.L;:PRINT TAB(65);: PRINT USING "$$######,###";ASSET.L
3670 PRINT:PRINT TAB(1);"TOTAL VALUE OWNED ASSETS";TAB(40);:PRINT USING "$$#####
#,###";TASSET.CB;:PRINT TAB(65);:PRINT USING"$$######,###";TASSETS.M
3680 PRINT:PRINT TAB(1);"VALUE OF RENTED LAND (acres=";INT(AR);")";TAB(47);"N/A"
;TAB(65);:PRINT USING "$$######,###";ASSET.PLR
3690 PRINT:PRINT TAB(1);"TOTAL VALUE OF RENTED & OWNED ASSETS";TAB(40);:PRINT US
ING "$$######,###";(TASSET.CB);:PRINT TAB(65);:PRINT USING "$$######,###";(ASSET
.PLR+TASSETS.M)
3700 REM PRINT"TO CONTINUE PRESS < C >";
3705 LOCATE 24,28: PRINT"To Continue Press < C >";
3710 IF INKEY$ = "C" OR INKEY$ = "c" THEN GOTO 3720:ELSE GOTO 3710
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3720 CLS
3730 PRINT TAB(1);"YEAR END BALANCE SHEET: DECEMBER 31,";TAB(38);:PRINT USING "#
###";YEAR;:PRINT TAB(50);"PAGE 2"
3740 PRINT TAB(1);"LIABILITIES AND NET WORTH";TAB(40);"MODIFIED COST";TAB(65);"M
ARKET VALUE"
3750 PRINT TAB(1);"CURRENT LIABILITIES"
3760 PRINT TAB(3);"- Operating loan (12 mo or less)";TAB(40);:PRINT USING "$$###
###,###";DBT.C;:PRINT TAB(65);:PRINT USING "$$######,###";DBT.C
3770 PRINT TAB(3);"- Current Port. Inter. Debt";TAB(40);:PRINT USING "$$######,#
##";CP.I;:PRINT TAB(65);:PRINT USING "$$######,###";CP.I
3780 PRINT TAB(3);"- Current Port. Long-Term Debt";TAB(40);:PRINT USING "$$#####
#,###";CP.L;:PRINT TAB(65);:PRINT USING "$$######,###";CP.L
3790 PRINT TAB(3);"- Land Lease Payable";TAB(40);:PRINT USING "$$######,###";LEA
PAY.C;:PRINT TAB(65);:PRINT USING "$$######,###";LEAPAY.C
3800 PRINT TAB(1);"TOTAL CURRENT LIABILITIES";TAB(40);:PRINT USING "$$######,###
";TDBT.C;:PRINT TAB(65);:PRINT USING"$$######,###";TDBT.C
3810 PRINT:PRINT TAB(1);"INTERMEDIATE LIABILITIES"
3820 PRINT TAB(3);"- Machinery/Bldg Loan";TAB(40);:PRINT USING "$$######,###";LP
DBT.I;:PRINT TAB(65);:PRINT USING "$$######,###";LPDBT.I
3830 PRINT TAB(3);"- Contingent Tax on Inter. Assets";TAB(47);"N/A";TAB(65);:PRI
NT USING "$$######,###";CCGT.I
3840 PRINT TAB(1);"TOTAL INTERMEDIATE LIABILITIES";TAB(40);:PRINT USING "$$#####
#,###";LPDBT.I;:PRINT TAB(65);:PRINT USING "$$######,###";TDBT.I
3850 PRINT:PRINT TAB(1);"LONG-TERM LIABILITIES"
3860 PRINT TAB(3);"- Real Estate Mortgage";TAB(40);:PRINT  USING"$$######,###";L
PDBT.L;:PRINT TAB(65);:PRINT USING"$$######,###";LPDBT.L
3870 PRINT TAB(3);"- Contingent Tax on Land";TAB(47);"N/A";TAB(65);:PRINT USING"
$$######,###";CCGT.L
3880 PRINT TAB(1);"TOTAL LONG-TERM LIABILITIES";TAB(40);:PRINT USING "$$######,#
##";LPDBT.L;:PRINT TAB(65);:PRINT USING "$$######,###";TDBT.L
3890 PRINT:PRINT TAB(1);"TOTAL LIABILITIES";TAB(40);:PRINT USING "$$######,###";
TDBT.CB;:PRINT TAB(65);:PRINT USING"$$######,###";TDBT.M
3900 PRINT:PRINT TAB(1);"NET WORTH";TAB(40);:PRINT USING"$$######,###";TEQTPOS.C
B;:PRINT TAB(65);:PRINT USING"$$######,###";TEQTPOS.M
3905 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:L
OCATE 20,15:PRINT S39$;S20$
3906 IF A$="C" OR A$="c" THEN GOTO 3930:ELSE GOTO 3907
3907 IF A$="B" OR A$="b" THEN GOTO 3520:ELSE GOTO 3905
3910 REM PRINT"TO CONTINUE PRESS < C >";
3920 REM IF INKEY$="C" OR INKEY$="c" THEN GOTO 3930:ELSE GOTO 3920
3930 CLS
3940 PRINT TAB(1);"YEAR END BALANCE SHEET: DECEMBER 31,";TAB(38);:PRINT USING "#
###";YEAR;:PRINT TAB(50);"PAGE 3"
3950 PRINT : PRINT : PRINT TAB(23);"CREDIT RESERVE SUMMARY INFORMATION":PRINT:PR
INT:PRINT
3960 PRINT USING "       MAXER.W        $$######,###                MAXEM.W
 $$######,###";MAXER.W;MAXEM.W:PRINT
3970 PRINT:PRINT USING "       CRDRESR.C      $$######,###                CRDRESM.
C      $$######,###";CRDRESR.C;CRDRESM.C
3980 PRINT:PRINT USING "       CRDRESR.I      $$######,###                CRDRESM.
I      $$######,###";CRDRESR.I;CRDRESM.I
3990 PRINT:PRINT USING "       CRDRESR.L      $$######,###                CRDRESM.
L      $$######,###";CRDRESR.L;CRDRESM.L
4000 PRINT:PRINT:PRINT USING "       CRDRESR.W      $$######,###                CR
DRESM.W      $$######,###";CRDRESR.W;CRDRESM.W
4005 LOCATE 24,10:INPUT"Press < C >ontinue or < B >ack To View Last Screen";A$:L
OCATE 20,15:PRINT S39$;S20$
4006 IF A$="C" OR A$="c" THEN GOTO 4024:ELSE GOTO 4007
4007 IF A$="B" OR A$="b" THEN GOTO 3720:ELSE GOTO 4005
4010 REM LOCATE 23,30:PRINT "PRESS < C > TO CONTINUE";
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4020 REM IF INKEY$ = "C" OR INKEY$ = "c" THEN GOTO 4023:ELSE GOTO 4020
4023 REM THIS IS REQUIRED TO PREVENT DOUBLE ACCOUNTING IN SUMMARY REPORTS
4024 VOLLIQU.I=0:VILLIQU.IT=0:VOLLIQU.LO=0:VOLLIQU.IO=0:VOLLIQU.LR=0:VOLLIQU.T=0
4025 CLS:LOCATE 9,27:PRINT "Model Now Loading Module No. 6a"
4030 BEEP:LOCATE 11,30:PRINT "One Moment Please ..."
4040 STORE=4:CHAIN "MOD6A",,ALL
4050 REM CREDIT RESERVE CHECKS
4055 PRINT"BEGINNING CREDIT CHECKS":STOP:TRON
4060 REM REAL ESTATE CREDIT RESERVE CHECK
4070 IF CRDRESR.L < MINCR.L THEN GOTO 4080:ELSE GOTO 4160
4080 IF AVAILASS.C > ABS(CRDRESR.L-MINCR.L) THEN DBT.L=DBT.L-ABS(CRDRESR.L-MINCR
.L):ASSET.C=ASSET.C-ABS(CRDRESR.L-MINCR.L):GOSUB 2720:GOTO 4160:ELSE GOTO 4090
4090 IF CRDRESR.C > ABS(CRDRESR.L-MINCR.L) THEN DBT.L=DBT.L-ABS(CRDRESR.L-MINCR.
L):DBT.C=DBT.C+ABS(CRDRESR.L-MINCR.L):GOSUB 2720:GOTO 4160:ELSE GOTO 4100
4100 TVOLLIQMIN.L=(ABS(CRDRESR.L-MINCR.L))/((1+GAMMA1S)*(1-ROW.L)*(1-DEL.L))
4110 REM CALCULATE INTERMEDIATE TVOLLIQMIN.LI
4120 TVOLLIQI.I=((ABS(CRDRESR.L-MINCR.L))-TVOLLIQMIN.L*(1-ROW.L)*(1-DEL.L))/(1+(
((1-ROW.L)*(1-DEL.L))/ROW.L))
4130 REM CALCULATE TVOLLIQMIN.LI
4140 TVOLLIQMIN.LI=((TVOLLIQI.I/(1-ROW.I))*(((1+DE.I)*(1/(1-ROW.I))^DE.I))/(1-RO
W.I))
4150 GOSUB 2370
4160 REM INTERMEDIATE ASSET CREDIT RESERVE CHECK
4170 IF CRDRESR.I < MINCR.I THEN GOTO 4180:ELSE GOTO 4250
4180 IF AVAILASS.C > ABS(CRDRESR.I-MINCR.I) THEN DBT.I=DBT.I-ABS(CRDRESR.I-MINCR
.I):ASSET.C=ASSET.C-ABS(CRDRESR.I-MINCR.I):GOSUB 2860:GOTO 4250:ELSE GOTO 4190
4190 REM CALCULATE REQUIRED MACHINERY LIQUIDATION
4200 TVOLLIQMIN.I=ABS(CRDRESR.I-MINCR.I)/((1+GAMMA1S)*(1-ROW.I)*(1-DEL.I))
4210 REM CALCULATE INTERMEDIATE TVOLLIQMIN.IL
4220 TVOLLIQI.L=(ABS(CRDRESR.I-MINCR.I)-TVOLLIQMIN.I*(1-ROW.I)*(1-DEL.I))/(1+((1
-ROW.I)*(1-DEL.I))/ROW.I)
4230 TVOLLIQMIN.IL=(TVOLLIQI.L/(1-ROW.L))*(1+(DE.L)*((1/(1-ROW.L))^DE.L))/(1-ROW
.L)
4240 GOSUB 2370
4250 REM CURRENT ASSET CREDIT RESERVE CHECK
4255 IF CRDRESR.C >= MINCR.C THEN GOSUB 4285:RETURN:ELSE GOTO 4257
4257 IF CRDRESR.C < MINCR.C AND REFINANCE$="n" OR REFINANCE$="N" THEN GOTO 4270:
ELSE GOTO 4350
4270 TVOLLIQMIN.C=ABS(CRDRESR.C-MINCR.C)/((1-ROW.C)*DEL.C)
4280 IF TVOLLIQMIN.C > (TASSET.C-MINRATIO.C*TDBT.C) THEN GOTO 4290:ELSE ASSET.C=
ASSET.C-TVOLLIQMIN.C:DBT.C=DBT.C-TVOLLIQMIN.C*(1-ROW.C):LPRINT"TVOLLIQMIN.C";TVO
LLIQMIN.C:GOTO 4340
4285 REM TROWCOST=ROW.C*(VOLLIQMIN.C+VOLLIQU.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I+
VOLLIQU.I)+ROW.L*(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.LO)+IROWCOST
4286 RETURN
4290 REM TEST FOR REFINANCE OPTION LONG TERM
4300 IF REFINANCE$="N" OR REFINANCE$="n" AND CRDRESR.L > (DBT.C+500+.05*DBT.C) T
HEN GOTO 4310:ELSE GOTO 4350:REM CALCULATE REAL ESTATE TO BE SOLD
4310 DBT.L=DBT.L+(DBT.C+500+.05*DBT.C):NEWDBT.L=DBT.C+500+.05*DBT.C:DBT.C=0:TVOL
LIQMIN.C=0
4320 REM SET THE REFINANCE OPTION STATUS
4330 REFINANCE$="Y":REFINYRS=1
4332 REM CALCULATING AN ADJUSTED NCF TO INCLUDE REFINANCING
4333 RTCA=INT(CROPSALE+OTHINC+NONFINC+TASSETLIQ+NEWDBT+(DBT.L-RLPDBT.L))
4334 RTCR=INT(TCEXP+CYRPIPMT+TOTTAX+DBTRET+CAPINV+WTHDRWLS+TROWCOST+PPDBT.I+PPDB
T.L+REFINCOST)
4335 RNCF=RTCA-RTCR
4336 IF RNCF > 0 THEN ASSET.C=ASSET.C+RNCF:GOTO 4340:ELSE RNCF=0:GOTO 4340
4340 GOSUB 2380:RETURN
4350 TVOLLIQMIN.L=TVOLLIQMIN.C/((1+GAMMA1S)*(1-ROW.L)*(1-DEL.L)):GOTO 4120
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4500 REM UPDATING REAL ESTATE VALUES FOR THE YEAR
4510 REM INITIALLY AVEGMPA(4)=1988, (3)=1987, (2)=1986, (1)=1985
4520 AVEGMPA(4)=AVEGMPA
4540 PYASSET.L=ASSET.L:REM TEMP VARIABLE TO CALCULATE R/E VALUE CHANGE
4551 WGTGMPA=(.15)*AVEGMPA(4)+(.35)*AVEGMPA(3)*(1+RRCR)+(.25)*AVEGMPA(2)*(1+RRCR
)^2+(.25)*AVEGMPA(1)*(1+RRCR)^3
4560 AVEVPA=PYASSET.L/AO
4570 TAXPAP=(TCFE(2)/AO)/AVEVPA:REM PROPERTY TAX AS A % OF MARKET VALUE PER ACRE
4580 IF TAXINC<=0 THEN NTAXRATE=0 ELSE NTAXRATE=TAX/TAXINC:REM FED TAX RATE FOR
YEAR
4600 REM FORMULAS USED IN REAL ESTATE VALUATION EQUATION
4605 REM STOP
4610 R1=(REIR(CYCLE)+(INFLA(CYCLE+1)-1)+(REIR(CYCLE)*(INFLA(CYCLE+1)-1)))
4620 D1=((R1*(1-NTAXRATE))-RRCR)
4630 D2=(1-((1+RRCR)^NOYRS)/(1+R1*(1-NTAXRATE))^NOYRS)
4640 D3=(1+R1*(1-NTAXRATE))^NOYRS
4650 D3QS=(1+IN.L)^TERM.L
4655 D3Q=(1+R1*(1-NTAXRATE))^TERM.L
4660 D4=((D3QS^-1)-(D3Q^-1))/(1-D3QS^-1)
4670 D1S=((R1*(1-NTAXRATE))-CONCRATE)
4680 K1=(1+CLOSEFEE)+(TAXPAP*(1-NTAXRATE)*D2)/D1 -((NTAXRATE*(1+CLOSEFEE))/D3)
4690 K2=(((1+RRCR)^NOYRS)*(1-REALFEE)*(1-NTAXRATE))/(K1*D3)
4700 FAC= CASHDP.L+((((1-CASHDP.L)*IN.L)/R1)*(1-D3Q^-1)/(1-D3QS^-1))+((NTAXRATE*
(1-CASHDP.L)*IN.L*D4)/D1S)
4710 K3=(FAC+CLOSEFEE-(NTAXRATE*(1+CLOSEFEE)/D3))
4720 S5=K1*(1-K2)-((TAXPAP*(1-NTAXRATE)*D2)/D1)+((1+RRCR)^NOYRS*(1-REALFEE)*(1-N
TAXRATE))/D3
4730 REM EQUATIONS FOR CALCULATING REVISED REAL ESTATE VALUES
4740 NPAR=PAR:NP=P:FOR I=1 TO NP:NASSETP.L(I)=ASSETP.L(I):NEXT I
4750 REM CALCULATES AVERAGE NO. OF ACRES FOR EACH PARCEL BASED ON THE AVE VALUE
PER ACRE
4760 FOR I=1 TO NP:NASSETPA.L(I)=NASSETP.L(I)/AVEVPA:NEXT I
4770 FOR I=1 TO NP:ASSETP.L(I)=(WGTGMPA*(1-NTAXRATE)*D2*S5)/(K3*K1*(1-K2)*D1)*NA
SSETPA.L(I)
4780 NEXT I
4790 NOASUM=0:FOR I=1 TO NP:NOASUM=NOASUM+NASSETPA.L(I):NEXT I:AO=NOASUM
4800 NSUM=0:FOR I=1 TO NP:NSUM=NSUM+ASSETP.L(I):NEXT I:ASSET.L=NSUM
4810 READJUST=ASSET.L-PYASSET.L
4930 REM UPDATING MOVING AVE. GROSS MARGIN PER ACRE FOR CURRENT YEAR'S AVERAGE R
ETURN PER ACRE
4940 FOR J=1 TO 4
4950 AVEGMPA(J)=AVEGMPA(J+1)
4960 NEXT J
4970 REM UPDATING CRDRESR.L AND CRDRESM.L FOR REAL ESTATE VALUATION ADJUSTMENTS
4980 EQTPOS.L=ASSET.L-DBT.L
4990 EQTPOSM.L=ASSET.L-(DBT.L+CCGT.L)
5000 CRDRESR.L=((1-ROW.L)*(1-DEL.L)/ROW.L)*EQTPOS.L-DBT.L
5010 CRDRESM.L=((1-ROW.L)/ROW.L)*EQTPOSM.L-(DBT.L+CCGT.L)
5020 RETURN
```

```
10 REM  ***************          MODULE 6          ***************
20 REM  *************** DATE LAST UPDATED 11/27/88  ***************
30 REM  *************** DATE LAST PRINTED 11/26/88  ***************
40 REM  *************** TIME LAST PRINTED 09:00 AM  ***************
50 REM $INCLUDE: 'MODCOM'
160 CYEAR=YEAR-1900
165 REM 5960 chain mod1a
166 CAPINV(4)=0:REM ZERO OUT END OF YEAR ASSET PURCHASE
170 CROPSALE=GRC+GRS-INSPMTC-INSPMTS
175 IF INTEARN < 0 THEN OTHINC=INSPMTC+INSPMTS:ELSE GOTO 180
178 GMCPA=GMC/TOTACRN:GMSPA=GMS/TOTASYB
180 IF INTEARN => 0 THEN OTHINC=INTEARN+INSPMTC+INSPMTS:ELSE OTHINC=INSPMTC+INSP
MTS
190 TOTFMREV=CROPSALE+OTHINC
200 TLABOR=CCVE(C,1)*TOTACRN+SCVE(S,1)*TOTASYB-OPLABOR
210 TREPAIRS=CFE(3)+CCVE(C,2)*TOTACRN+SCVE(S,2)*TOTASYB
230 TRENT=TCFE(1)
240 SUMC=0:SUMS=0:FOR I=3 TO 11:SUMC=SUMC+CCVE(C,I):SUMS=SUMS+SCVE(S,I):NEXT I
250 CROPEXP=(SUMC+PREMC)*TOTACRN+(SUMS+PREMS)*TOTASYB
260 TLANDTXINS=TCFE(2)+TCFE(4)
265 REM TROWCOST=ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I+VOLLIQU.I+F
ORLIQ.I)+ROW.L*(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.LO+FORLIQ.L)+ROW.C*VOLLIQU.C+VO
LLIQU.IT*ROW.I
266 REM TROWCOST=ABS(ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I+VOLLIQU
.I+FORLIQ.I)+ROW.L*(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.LO+FORLIQ.L)+ROW.C*VOLLIQU.
C+IROWCOST):REM IROWCOST CAL L990-1000 MOD4A;IROWCOST REPLACED BOTH TOTOPVOLL &
XMACH
267 RTROWCOST=TROWCOST+ROW.L*FORLIQ.L+ROW.I*FORLIQ.I:REM ABS(ROW.C*(VOLLIQMIN.C)
+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I+VOLLIQU.I+FORLIQ.I)+ROW.L*(VOLLIQMIN.L+VOLLIQMI
N.IL+VOLLIQU.LO+FORLIQ.L)+ROW.C*VOLLIQU.C+IROWCOST):REM IROWCOST CAL L990-1000 M
OD4A;IROWCOST R
270 TMISCELL=CCVE(C,12)*TOTACRN+SCVE(S,12)*TOTASYB+CFE(5)+DQCCEXP+DQCSEXP
275 TSUMCFE=CFE(3)+CFE(5)+TCFE(1)+TCFE(2)+TCFE(4)
277 TOPINT=(SUMC+PREMC)*TOTACRN*IN.C*.5+(SUMS+PREMS)*TOTASYB*IN.C*.5+CYRINDBT.C+
(TSUMCFE*IN.C*.5)+(TLABOR+TREPAIRS-CFE(3))*IN.C*.5
280 TOTOPEXP=TLABOR+TREPAIRS+TOPINT+TRENT+CROPEXP+TLANDTXINS+TMISCELL+CYRDEPREC
290 TOTINCAP=CYRINDBT.I+CYRINDBT.L
300 INCFRMOP=TOTFMREV-TOTOPEXP-TOTINCAP
303 TFORLIQ=FORLIQ.I+FORLIQ.L
305 REM TASSETLIQ=VOLLIQU.LO+VOLLIQU.I+VOLLIQU.C+VOLLIQU.IT+VOLLIQMIN.C+VOLLIQMI
N.I+VOLLIQMIN.L+VOLLIQMIN.LI+VOLLIQMIN.IL+TFORLIQ
306 TASSETLIQ=TOTOPVOLL+VOLLIQMIN.C+VOLLIQMIN.I+VOLLIQMIN.L+VOLLIQMIN.LI+VOLLIQM
IN.IL+TFORLIQ
307 TXGAIN=TXGAIN+TGFORLIQ.I+TGFORLIQ.L
310 REM TROWCOST=ROW.C*(VOLLIQMIN.C)+ROW.I*(VOLLIQMIN.LI+VOLLIQMIN.I+VOLLIQU.I+F
ORLIQ.I)+ROW.L*(VOLLIQMIN.L+VOLLIQMIN.IL+VOLLIQU.LO+FORLIQ.L)+ROW.C*VOLLIQU.C+VO
LLIQU.IT*ROW.I
318 TCPEXP=INT(TOTOPEXP-CYRDEPREC+635)
320 TCA=INT(CROPSALE+OTHINC+TASSETLIQ+NONFINC+NEWDBT+NEWDBT.L)
325 TCR=INT(TCPEXP+CAPINV+CYRPIPMT+PPDBT.L+PPDBT.I+DBTRET+TOTTAX+AFAMLIVING+CASH
OUT+TROWCOST):REM TPIPMT CALCULATED IN MOD4A L2195
326 NCF=TCA-TCR
330 NIBT=INCFRMOP-TROWCOST+TXGAIN
335 NIAT=NIBT-TOTTAX+NONFINC
340 CLS:COLOR 15:REM SUMMARY TABLE SUBROUTINE
350 HOR=205:VER=186:MD=203:MU=202
360 URC=201:LRC=200:ULC=187:LLC=188
370 FOR J=1 TO 2
380 IF J=1 THEN LOCATE 1,1:PRINT CHR$(URC);:ELSE LOCATE 24,1:PRINT CHR$(LRC);
390 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
```

```
400 IF J=1 THEN PRINT CHR$(MD);:ELSE PRINT CHR$(MU);
410 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
420 IF J=1 THEN PRINT CHR$(ULC);:ELSE PRINT CHR$(LLC);
430 NEXT J
440 FOR X=2 TO 23
450 FOR Y=1 TO 80 STEP 40
460 IF Y>1 THEN Y=Y-1
470 LOCATE X,Y
480 PRINT CHR$(VER);
490 NEXT Y
500 NEXT X
510 REM WIDTH 40
520 REM MENU FOR MOD.6 SCREEN DISPLAY AND HARD COPY
530 LOCATE 1,22:PRINT " SUMMARY INFORMATION REPORTS :";YEAR;
540 LOCATE 24,21:PRINT " PRESS < C > TO CONTINUE TO NEXT CYCLE ";
550 LOCATE 3,50:PRINT "SUMMARY TITLES":COLOR 7
560 LOCATE 5,43:PRINT "1) BALANCE SHEET SUMMARY"
570 LOCATE 7,43:PRINT "2) FINANCIAL MANAGEMENT SUMMARY"
580 LOCATE 9,43:PRINT "3) INCOME SUMMARY STATEMENT"
590 LOCATE 11,43:PRINT "4) CASH FLOW SUMMARY STATEMENT"
600 LOCATE 13,43:PRINT "5) OPERATIONAL SUMMARY STATISTICS"
610 LOCATE 15,43:PRINT "6) LENDER INPUT SUMMARY INFORMATION"
620 LOCATE 17,43:PRINT "7) PRODUCTION AND MARKETING SUMMARY"
630 LOCATE 19,43:PRINT "8) OPTIMIZATION MATRIX SUMMARY"
640 LOCATE 21,43:PRINT "9) HARD COPY OF ALL OF THE ABOVE"
650 LOCATE 3,8:COLOR 15:PRINT "Instructions ...":COLOR 7
660 LOCATE 5,4:PRINT "You may view any screen by pressing"
670 LOCATE 7,4:PRINT "it's number. Then you can ...      "
680 LOCATE 9,4:COLOR 15:PRINT "  < R >";:COLOR 7:PRINT" eturn to this menu"
690 LOCATE 11,4:COLOR 15:PRINT"  < F >";:COLOR 7:PRINT" orward to the next scree
n"
700 LOCATE 13,4:COLOR 15:PRINT"  < B >";:COLOR 7:PRINT" ackward to the last scre
en"
710 LOCATE 15,4:COLOR 15:PRINT"  < H >";:COLOR 7:PRINT" ard copy of screen"
720 LOCATE 17,4:PRINT"You can also receive hard copies of"
730 LOCATE 19,4:PRINT"all the screens by selecting number"
740 LOCATE 21,4:PRINT"9 from the list of options."
750 REM MENU CONTROL LOOP
760 TEST1$=" 123456789Cc":TEST2$=" RrBbFfHh"
770 D$=INKEY$:IF INSTR(TEST1$,D$) < 2 THEN 770
780 D1=INSTR(TEST1$,D$)
790 IF D1=10 THEN GOTO 900
800 IF D1>10 THEN GOTO 5790
810 IF HARDCOPY.FLAG=1 THEN HARDCOPY.FLAG=0:GOSUB 6040:GOTO 830
820 ON D1 GOSUB  340,920,1590,2250,2920,3480,4130,4820,5310,340,340
830 D$=INKEY$:IF INSTR(TEST2$,D$) < 2 THEN 830
840 D2=INSTR(TEST2$,D$)
850 ON D2-1 GOSUB 340,340,870,870,880,880,890,890
860 GOTO 790:REM END OF MENU CONTROL LOOP
870 D1=D1-1:RETURN
880 D1=D1+1:RETURN
890 GOSUB 5980:HARDCOPY.FLAG=1:RETURN
900 FOR II= 1 TO 8:ON II GOSUB 920,1590,2250,2920,3480,4130,4820,5310:NEXT II
910 GOTO 340
920 REM SUMMARY PAGES
930 REM BALANCE SHEET SUMMARY
940 CLS
950 PRINT; USERNAM$;TAB(31);"BALANCE SHEET SUMMARY";TAB(69);"YEAR:"YEAR:PRINT
955 CYEAR=YEAR-1900
960 REM PRINT TAB(15);"12/31/83";TAB(33);"1/1/84";TAB(51);"1/1/84";TAB(69);"12/3
```

```
1/84":PRINT
961 PRINT TAB(17);"12/31/";TAB(23);:PRINT USING "##";CYEAR-1;:PRINT TAB(37);"1/1
/";TAB(41);:PRINT USING "##";CYEAR;:PRINT TAB(55);"1/1/";TAB(59);:PRINT USING "#
#";CYEAR;:PRINT TAB(71);"12/31/";TAB(77);:PRINT USING "##";CYEAR;:PRINT
970 PRINT"CUR ASSETS"
980 PRINT "INT ASSETS"
990 PRINT "LT ASSETS"
1000 PRINT "TOTAL ASSETS"
1010 PRINT "CURRENT LIAB"
1020 PRINT "INTMED. LIAB"
1030 PRINT "LONG TERM LIAB"
1040 PRINT "TOTAL LIAB"
1050 PRINT "NET WORTH"
1060 PRINT "RESTRICTED-CUR"
1070 PRINT "RESTRICTED-INT"
1080 PRINT "RESTRICTED-LONG"
1090 PRINT "RESTRICTED-WGT"
1100 PRINT "CURRENT RATIO"
1110 PRINT "DEBT/EQUITY"
1120 PRINT "PERCENT EQUITY"
1130 PRINT "OWNED ACREAGE"
1140 PRINT "RENTAL ACREAGE"
1150 PRINT "RENT/TOTAL %"
1160 FOR J= 1 TO 4
1170 LOCATE 4,1
1180 IF J=1 THEN X= 15:ELSE X=X+18
1190 LOCATE CSRLIN,X
1200 PRINT USING"$$#####,###";TASSET.C(J)
1210 LOCATE CSRLIN,X
1220 PRINT USING"$$#####,###";ASSET.I(J)
1230 LOCATE CSRLIN,X
1240 PRINT USING"$$#####,###";ASSET.L(J)
1250 LOCATE CSRLIN,X
1260 PRINT USING"$$#####,###";TASSETS.M(J)
1270 LOCATE CSRLIN,X
1280 PRINT USING"$$#####,###";TDBT.C(J)
1290 LOCATE CSRLIN,X
1300 PRINT USING"$$#####,###";TDBT.I(J)
1310 LOCATE CSRLIN,X
1320 PRINT USING"$$#####,###";TDBT.L(J)
1330 LOCATE CSRLIN,X
1340 PRINT USING"$$#####,###";TDBT.M(J)
1350 LOCATE CSRLIN,X
1360 PRINT USING"$$#####,###";TEQTPOS.M(J)
1370 LOCATE CSRLIN,X
1380 PRINT USING"$$#####,###";CRDRESR.C(J)
1390 LOCATE CSRLIN,X
1400 PRINT USING"$$#####,###";CRDRESR.I(J)
1410 LOCATE CSRLIN,X
1420 PRINT USING"$$#####,###";CRDRESR.L(J)
1430 LOCATE CSRLIN,X
1440 PRINT USING"$$#####,###";CRDRESR.W(J)
1450 LOCATE CSRLIN,X
1460 PRINT USING"      ##.##:1";TASSET.C(J)/TDBT.C(J)
1470 LOCATE CSRLIN,X
1480 PRINT USING"      ##.##:1";TDBT.M(J)/TEQTPOS.M(J)
1490 LOCATE CSRLIN,X
1500 PRINT USING"      ##.##%";INT((TEQTPOS.M(J)/TASSETS.M(J))*100)
1510 LOCATE CSRLIN,X
1520 PRINT USING"  #####,###";AO(J)
```

```
1530 LOCATE CSRLIN,X
1540 PRINT USING"  #####,###";AR(J)
1550 LOCATE CSRLIN,X
1560 PRINT USING"    ###.##%";INT((AR(J)/(AO(J)+AR(J)))*100)
1570 NEXT J
1580 GOSUB 6040:RETURN
1590 REM SUMMARY PAGES
1600 REM FINANCIAL MANAGEMENT SUMMARY
1610 CLS
1620 PRINT; USERNAM$;TAB(28);"FINANCIAL MANAGEMENT SUMMARY";TAB(69);"YEAR:"YEAR:
PRINT
1630 PRINT TAB(17);"12/31/";TAB(23);:PRINT USING "##";CYEAR-1;:PRINT TAB(37);"1/
1/";TAB(41);:PRINT USING "##";CYEAR;:PRINT TAB(55);"1/1/";TAB(59);:PRINT USING "
##";CYEAR;:PRINT TAB(71);"12/31/";TAB(77);:PRINT USING "##";CYEAR;:PRINT
1640 PRINT "RESTRICTED-CUR"
1650 PRINT "RESTRICTED-INT"
1660 PRINT "RESTRICTED-LONG"
1670 PRINT "RESTRICTED-WGT"
1680 PRINT
1690 PRINT "E0"
1700 PRINT "E1"
1710 PRINT "PROB BKRCY"
1720 PRINT
1730 PRINT "MAXER"
1740 PRINT "MAXEM"
1750 PRINT "CF EXPOS-CORN"
1760 PRINT "CF EXPOS-SOY"
1770 PRINT
1780 PRINT "ASSET PURCHASE"
1790 PRINT "CURR/TOTAL DBT"
1800 PRINT "INT/TOTAL DBT"
1810 PRINT "LTLIAB/TLIAB"
1820 PRINT "SCH. REPAYMENT"
1830 FOR J= 1 TO 4
1840 LOCATE 4,1
1850 IF J=1 THEN X= 15:ELSE X=X+18
1860 LOCATE CSRLIN,X
1870 PRINT USING"$$#####,###";CRDRESR.C(J)
1880 LOCATE CSRLIN,X
1890 PRINT USING"$$#####,###";CRDRESR.I(J)
1900 LOCATE CSRLIN,X
1910 PRINT USING"$$#####,###";CRDRESR.L(J)
1920 LOCATE CSRLIN,X
1930 PRINT USING"$$#####,###";CRDRESR.W(J)
1940 LOCATE CSRLIN,X
1950 PRINT
1960 LOCATE CSRLIN,X
1970 PRINT USING"       ##.##";E0(J)
1980 LOCATE CSRLIN,X
1990 PRINT USING"       ##.##";E1(J)
2000 LOCATE CSRLIN,X
2010 PRINT USING"     ##.##%";PRBBRY(J)
2020 PRINT
2030 LOCATE CSRLIN,X
2040 PRINT USING"$$#####,###";MAXER.W(J)
2050 LOCATE CSRLIN,X
2060 PRINT USING"$$#####,###";MAXEM.W(J)
2070 LOCATE CSRLIN,X
2080 PRINT USING"$$#####,###";ACFXPC(J)
2090 LOCATE CSRLIN,X
```

```
2100 PRINT USING"$$#####,###";ACFXPS(J)
2110 LOCATE CSRLIN,X
2120 PRINT
2130 LOCATE CSRLIN,X
2140 PRINT USING"$$#####,###";CAPINV(J)
2150 LOCATE CSRLIN,X
2160 PRINT USING"    ###.###%";INT((TDBT.C(J)/TDBT.M(J))*100)
2170 LOCATE CSRLIN,X
2180 PRINT USING"    ###.###%";INT((TDBT.I(J)/TDBT.M(J))*100)
2190 LOCATE CSRLIN,X
2200 PRINT USING"    ###.###%";INT((TDBT.L(J)/TDBT.M(J))*100)
2210 LOCATE CSRLIN,X
2220 PRINT USING"$$#####,###";PIPMT(J)
2230 NEXT J
2240 GOSUB 6040:RETURN
2250 REM INCOME STATEMENT SUMMARY EQUATIONS
2260 CLS
2270 PRINT; USERNAM$;TAB(28);"INCOME STATEMENT SUMMARY";TAB(69);"YEAR:";YEAR:PRI
NT
2280 PRINT "Crop Sale"
2290 PRINT "Other Income"
2300 PRINT "Total Farm Revenue"
2310 PRINT "Expenses :  Hired Labor"
2320 PRINT"             Repairs"
2330 PRINT"             Operating Interest"
2340 PRINT"             Rent"
2350 PRINT"             Crop Expenses"
2360 PRINT"             Land Taxes & Insurance"
2370 PRINT"             Miscellaneous"
2380 PRINT"             Depreciation"
2390 PRINT"Total Operating Expenses"
2400 PRINT"Intermediate & Long Term Interest"
2410 PRINT"Income from Farm Operations"
2420 PRINT"Asset Liquidation Expenses"
2430 PRINT"Gain (Loss) from Sale of Farm Assets"
2440 PRINT"Net Farm Income Before Tax"
2450 PRINT"Gross Non-Farm Income"
2460 PRINT"Taxes & Social Security less ITC"
2470 PRINT"Net Income After Tax"
2480 X=3:Y=40
2490 LOCATE X,Y
2500 PRINT USING"$$######,###";INT(CROPSALE)
2510 X=X+1:LOCATE X,Y
2520 PRINT USING"$$######,###";INT(OTHINC)
2530 X=X+1:Y=Y+15:LOCATE X,Y
2540 PRINT USING"$$######,###";INT(TOTFMREV)
2550 X=X+1:Y=Y-15:LOCATE X,Y
2560 PRINT USING"$$######,###";INT(TLABOR)
2570 X=X+1:LOCATE X,Y
2580 PRINT USING"$$######,###";INT(TREPAIRS)
2590 X=X+1:LOCATE X,Y
2600 PRINT USING"$$######,###";INT(TOPINT)
2610 X=X+1:LOCATE X,Y
2620 PRINT USING"$$######,###";INT(TRENT)
2630 X=X+1:LOCATE X,Y
2640 PRINT USING"$$######,###";INT(CROPEXP)
2650 X=X+1:LOCATE X,Y
2660 PRINT USING"$$######,###";INT(TLANDTXINS)
2670 X=X+1:LOCATE X,Y
2680 PRINT USING"$$######,###";INT(TMISCELL)
```

```
2690 X=X+1:LOCATE X,Y
2700 PRINT USING"$$######,###";INT(CYRDEPREC)
2710 X=X+1:Y=Y+15:LOCATE X,Y
2720 PRINT USING"$$######,###";INT(TOTOPEXP)
2730 X=X+1:Y=Y-15:LOCATE X,Y
2740 PRINT USING" - $$######,###";INT(TOTINCAP)
2750 X=X+1:Y=Y+15:LOCATE X,Y
2760 PRINT USING"$$######,###";INT(INCFRMOP)
2770 X=X+1:Y=Y-15:LOCATE X,Y
2780 PRINT USING" - $$######,###";INT(TROWCOST)
2790 X=X+1:LOCATE X,Y
2800 PRINT USING"   $$######,###";INT(TXGAIN)
2810 X=X+1:Y=Y+15:LOCATE X,Y
2820 PRINT USING"$$######,###";INT(NIBT)
2830 X=X+1:Y=Y-15:LOCATE X,Y
2840 PRINT USING" + $$######,###";INT(NONFINC)
2850 X=X+1:LOCATE X,Y
2860 PRINT USING" - $$######,###";INT(TOTTAX)
2870 X=X+1:Y=Y+15:LOCATE X,Y
2880 PRINT USING"$$######,###";INT(NIAT)
2890 GOSUB 6040:RETURN
2900 REM SUMMARY PAGES
2910 REM CASH FLOW SUMMARY SHEET
2920 CLS
2930 PRINT; USERNAM$;TAB(31);"CASH FLOW SUMMARY";TAB(69);"YEAR:";YEAR:PRINT
2940 PRINT "    SOURCES OF CASH"
2950 PRINT "CASH RECEIPTS : OPERATIONS"
2960 PRINT "OTHER FARM INCOME"
2970 PRINT "CAPITAL ASSET SALES"
2980 PRINT "NON FARM INCOME"
2990 PRINT "NEW INTERMED & LONG TERM DEBT"
3000 PRINT "TOTAL CASH AVAILABLE"
3010 PRINT
3020 PRINT "     USES OF CASH":PRINT
3030 PRINT "TOTAL CASH OPERATING EXPENSES"
3040 PRINT "CAPITAL ASSET PURCHASES"
3050 PRINT "INTERMED & LONG TERM P & I PMTS"
3060 PRINT "TAXES AND SOCIAL SECURITY"
3070 PRINT "FAMILY LIVING WITHDRAWAL"
3080 PRINT "NON-FARM CASH WITHDRAWAL"
3090 PRINT "ASSET LIQUIDATION EXPENSES"
3100 PRINT "TOTAL CASH REQUIRED"
3110 PRINT
3120 PRINT "NET CASH FLOW < DEFICIT >"
3130 PRINT "FORCED ASSET LIQUIDATION"
3140 X=4:Y=40
3150 LOCATE X,Y:X=X+1
3160 PRINT USING "$$######,###";INT(CROPSALE)
3170 LOCATE X,Y:X=X+1
3180 PRINT USING "$$######,###";INT(OTHINC)
3190 LOCATE X,Y:X=X+1
3200 PRINT USING "$$######,###";INT(TASSETLIQ)
3210 LOCATE X,Y:X=X+1
3220 PRINT USING "$$######,###";INT(NONFINC)
3230 LOCATE X,Y:X=X+1:Y=Y+15
3240 PRINT USING "$$######,###";INT(NEWDBT+NEWDBT.L)
3250 LOCATE X,Y:X=X+4:Y=Y-15
3260 PRINT USING "$$######,###";INT(TCA)
3270 LOCATE X,Y:X=X+1
3280 PRINT USING "$$######,###";INT(TCPEXP)
```

```
3290 LOCATE X,Y:X=X+1 _ _
3300 PRINT USING "$$######,###";INT(CAPINV)
3310 LOCATE X,Y:X=X+1
3320 PRINT USING "$$######,###";INT(CYRPIPMT+PPDBT.L+PPDBT.I+DBTRET)
3330 LOCATE X,Y:X=X+1
3340 PRINT USING "$$######,###";INT(TOTTAX)
3350 LOCATE X,Y:X=X+1
3360 PRINT USING "$$######,###";INT(AFAMLIVING)
3370 LOCATE X,Y:X=X+1
3380 PRINT USING "$$######,###";INT(CASHOUT)
3390 LOCATE X,Y:X=X+1:Y=Y+15
3400 PRINT USING "$$######,###";INT(TROWCOST)
3410 LOCATE X,Y:X=X+2
3420 PRINT USING "$$######,###";INT(TCR)
3430 LOCATE X,Y:X=X+1
3440 PRINT USING "$$######,###";INT(NCF)
3450 LOCATE X,Y:X=X+1
3460 PRINT USING "$$######,###";INT(TFORLIQ)
3470 GOSUB 6040:RETURN
3480 REM SUMMARY PAGES
3490 REM OPERATIONAL SUMMARY STATISTICS
3500 CLS
3510 PRINT; USERNAM$;TAB(28);"OPERATIONAL SUMMARY STATISTICS";TAB(69);"YEAR:";YE
AR:PRINT
3520 PRINT TAB(17);"12/31/";TAB(23);:PRINT USING "##";CYEAR-1;:PRINT TAB(37);"1/
1/";TAB(41);:PRINT USING "##";CYEAR;:PRINT TAB(55);"1/1/";TAB(59);:PRINT USING "
##";CYEAR;:PRINT TAB(71);"12/31/";TAB(77);:PRINT USING "##";CYEAR;:PRINT
3525 REM STOP
3530 PRINT "VLIQMIN.C"
3540 PRINT "VLIQMIN.I"
3550 PRINT "VLIQMIN.IL"
3560 PRINT "VLIQMIN.L"
3570 PRINT "VLIQMIN.LI"
3580 PRINT "VOLLIQU.I"
3590 PRINT"VOLLIQU.IT"
3600 PRINT"VOLLIQU.LO"
3610 PRINT"VOLLIQU.LR"
3620 PRINT"VOLLIQU.T"
3630 PRINT
3640 PRINT "FORCE M/E SALE"
3650 PRINT "FORCE R/E SALE"
3660 PRINT "FORCE SALE TOT"
3670 PRINT
3680 PRINT "TOTAL LIQ COSTS"
3690 PRINT "AVAILABLE CASH"
3700 PRINT
3710 PRINT "MACH-R/E RATIO"
3720 PRINT "LAMDA"
3730 FOR J= 1 TO 4
3740 LOCATE 4,1
3750 IF J=1 THEN X= 15:ELSE X=X+18
3760 LOCATE CSRLIN,X
3770 PRINT USING"$$#####,###";VOLLIQMIN.C(J)
3780 LOCATE CSRLIN,X
3790 PRINT USING"$$#####,###";VOLLIQMIN.I(J)
3800 LOCATE CSRLIN,X
3810 PRINT USING"$$#####,###";VOLLIQMIN.IL(J)
3820 LOCATE CSRLIN,X
3830 PRINT USING"$$#####,###";VOLLIQMIN.L(J)
3840 LOCATE CSRLIN,X
```

```
3850 PRINT USING"$$#####,###";VOLLIQMIN.LI(J)
3860 LOCATE CSRLIN,X
3870 PRINT USING"$$#####,###";VOLLIQU.I(J)
3880 LOCATE CSRLIN,X
3890 PRINT USING"$$#####,###";VOLLIQU.IT(J)
3900 LOCATE CSRLIN,X
3910 PRINT USING"$$#####,###";VOLLIQU.LO(J)
3920 LOCATE CSRLIN,X
3930 PRINT USING"$$#####,###";VOLLIQU.LR(J)
3940 LOCATE CSRLIN,X
3950 PRINT USING"$$#####,###";VOLLIQU.T(J)
3960 LOCATE CSRLIN+1,X
3970 PRINT USING"$$#####,###";FORLIQ.I(J)
3980 LOCATE CSRLIN,X
3990 PRINT USING"$$#####,###";FORLIQ.L(J)
4000 LOCATE CSRLIN,X
4010 PRINT USING"$$#####,###";(FORLIQ.I(J)+FORLIQ.L(J))
4020 LOCATE CSRLIN+1,X
4030 PRINT USING"$$#####,###";RTROWCOST(J)
4040 LOCATE CSRLIN,X
4050 PRINT USING"$$#####,###";AVAILASS.C(J)
4060 LOCATE CSRLIN+1,X
4070 PRINT USING"      ##.###";GAMMA1S(J)
4080 LOCATE CSRLIN,X
4090 PRINT USING"  #.#######";LAMDA
4100 NEXT J
4110 GOSUB 6040:RETURN
4120 REM SUMMARY PAGES
4130 REM LENDER INPUT SUMMARY
4140 CLS
4150 PRINT; USERNAM$;TAB(30);"LENDER INPUT SUMMARY";TAB(69);"YEAR:";YEAR:PRINT
4160 PRINT TAB(17);"12/31/";TAB(23);:PRINT USING "##";CYEAR-1;:PRINT TAB(37);"1/
1/";TAB(41);:PRINT USING "##";CYEAR;:PRINT TAB(55);"1/1/";TAB(59);:PRINT USING "
##";CYEAR;:PRINT TAB(71);"12/31/";TAB(77);:PRINT USING "##";CYEAR;:PRINT
4161 REM PRINT TAB(15);"12/31/";TAB(21);:PRINT USING "##";CYEAR-1;:PRINT TAB(33)
;"1/1/";TAB(37);:PRINT USING "##";CYEAR;:PRINT TAB(51);"1/1/";TAB(55);:PRINT USI
NG "##";CYEAR;:PRINT TAB(69);"12/31/";TAB(75);:PRINT USING "##";CYEAR;:PRINT
4170 PRINT"INT RATE-CUR"
4180 PRINT "INT RATE-INT"
4190 PRINT "INT RATE-LONG"
4200  PRINT "LIQ PREM-CUR"
4210 PRINT "LIQ PREM-INT"
4220 PRINT "LIQ PREM-LONG"
4230 PRINT "LIQ PREM-WGT"
4240 PRINT "CRED VAR-CUR"
4250 PRINT "CRED VAR-INT"
4260 PRINT "CRED VAR-LONG"
4270 PRINT "CRED VAR-WGT"
4280 PRINT "CASH DP-CUR"
4290 PRINT "CASH DP-INT"
4300 PRINT "CASH DP-LONG"
4310 PRINT "LOAN TERM-CUR"
4320 PRINT "LOAN TERM-INT"
4330 PRINT "LOAN TERM-LONG"
4340 PRINT "MIN CRDRES-CUR"
4350 PRINT "MIN CRDRES-INT"
4360 PRINT "MIN CRDRES-LONG"
4370 FOR J= 1 TO 4
4380 LOCATE 4,1
4390 IF J=1 THEN X= 15:ELSE X=X+18
```

```
4400 LOCATE CSRLIN,X
4410 PRINT USING"     ##.##%";IN.C(J)*100
4420 LOCATE CSRLIN,X
4430 PRINT USING"     ##.##%";IN.I(J)*100
4440 LOCATE CSRLIN,X
4450 PRINT USING"     ##.##%";IN.L(J)*100
4460 LOCATE CSRLIN,X
4470 PRINT USING"    ##.## %";ROW.C(J)*100
4480 LOCATE CSRLIN,X
4490 PRINT USING"    ##.## %";ROW.I(J)*100
4500 LOCATE CSRLIN,X
4510 PRINT USING"    ##.## %";ROW.L(J)*100
4520 LOCATE CSRLIN,X
4530 PRINT USING"    ##.## %";ROW.WE0(J)*100
4540 LOCATE CSRLIN,X
4550 PRINT USING"      ##.##";DEL.C(J)
4560 LOCATE CSRLIN,X
4570 PRINT USING"      ##.##";DEL.I(J)
4580 LOCATE CSRLIN,X
4590 PRINT USING"      ##.##";DEL.L(J)
4600 LOCATE CSRLIN,X
4610 PRINT USING"      ##.##";DEL.WE0(J)
4620 LOCATE CSRLIN,X
4630 PRINT USING"    ##.## %";CASHDP.C(J)*100
4640 LOCATE CSRLIN,X
4650 PRINT USING"    ##.## %";CASHDP.I(J)*100
4660 LOCATE CSRLIN,X
4670 PRINT USING"    ##.## %";CASHDP.L(J)*100
4680 LOCATE CSRLIN,X
4690 PRINT USING"      ##.##";TERM.C(J)
4700 LOCATE CSRLIN,X
4710 PRINT USING"      ##.##";TERM.I(J)
4720 LOCATE CSRLIN,X
4730 PRINT USING"      ##.##";TERM.L(J)
4740 LOCATE CSRLIN,X
4750 PRINT USING"$$#####,###";MINCR.C(J)
4760 LOCATE CSRLIN,X
4770 PRINT USING"$$#####,###";MINCR.I(J)
4780 LOCATE CSRLIN,X
4790 PRINT USING"$$#####,###";MINCR.L(J)
4800 NEXT J
4810 GOSUB 6040:RETURN
4820 CLS: REM SUMMARY TABLE SUBROUTINE
4830 HOR=205:VER=186:MD=203:MU=202
4840 URC=201:LRC=200:ULC=187:LLC=188
4850 FOR J=1 TO 2
4860 IF J=1 THEN LOCATE 1,1:PRINT CHR$(URC);:ELSE LOCATE 24,1:PRINT CHR$(LRC);
4870 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
4880 IF J=1 THEN PRINT CHR$(MD);:ELSE PRINT CHR$(MU);
4890 FOR I=1 TO 38:PRINT CHR$(HOR);:NEXT I
4900 IF J=1 THEN PRINT CHR$(ULC);:ELSE PRINT CHR$(LLC);
4910 NEXT J
4920 FOR X=2 TO 23
4930 FOR Y=1 TO 80 STEP 40
4940 IF Y>1 THEN Y=Y-1
4950 LOCATE X,Y
4960 PRINT CHR$(VER);
4970 NEXT Y
4980 NEXT X
4990 IF SELC=10 AND SELS =10 THEN X=4:ELSE X=3
```

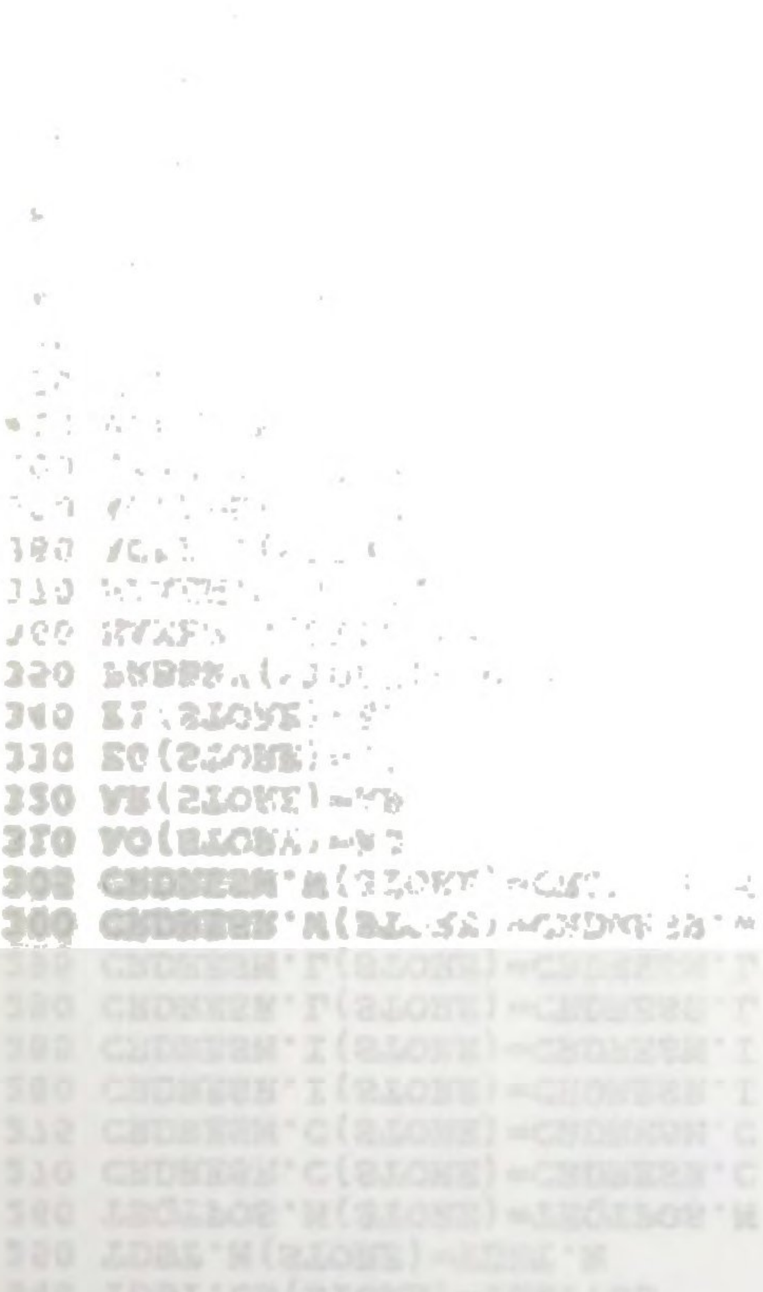
```
5000 LOCATE X,18:PRINT "CORN":LOCATE X,55:PRINT "SOYBEANS"
5010 IF SELC=10 AND SELS= 10 THEN X=X+3:ELSE X=X+2
5020 LOCATE X,4:PRINT TOTACRN;" ACRES";S5$;"(";CAP;"% TOTAL )":LOCATE X,42:PRINT
 TOTASYB;" ACRES";S5$;"(";SAP;"% TOTAL )"
5030 X=X+2
5040 LOCATE X,5:PRINT USING "ACTUAL PRICE    :  $$#.##";STOPC:LOCATE X,43:PRINT
USING "ACTUAL PRICE   :  $$#.##";STOPS
5050 X=X+2
5060 LOCATE X,5:PRINT USING "ACTUAL YIELD    :   ### BU";STOYC:LOCATE X,43:PRINT
 USING "ACTUAL YIELD   :    ## BU";STOYS
5070 X=X+2
5080 LOCATE X,5:PRINT USING "CASH VAR. EXP. PER ACRE : $$###.##";SUMCCVE:LOCATE
X,43:PRINT USING "CASH VAR. EXP. PER ACRE : $$###.##";SUMSCVE
5090 X=X+2
5100 LOCATE X,5:PRINT USING "GROSS MARGIN PER ACRE   : $$###.##";GMCPA:LOCATE X,
43:PRINT USING "GROSS MARGIN PER ACRE   : $$###.##";GMSPA
5110 X=X+2
5120 LOCATE X,5:PRINT USING "FORWARD CONTRACTED PERCENT : ## %";FCCP:LOCATE X,43
:PRINT USING "FORWARD CONTRACTED PERCENT : ## %";FSCP
5130 X=X+2:Y=X
5140 IF SELC = 10 THEN LOCATE X,5:PRINT "ALL-RISK INSURANCE  :  NO":GOTO 5210:EL
SE LOCATE X,5:PRINT "ALL-RISK INSURANCE   :  YES"
5150 X=X+2
5160 LOCATE X,9:PRINT USING "Guaranteed Yield :   ### BU";GYC:X=X+1
5170 LOCATE X,9:PRINT USING "Indemnity Price  :   $$#.##";IPC:X=X+1
5180 LOCATE X,9:PRINT USING "Premium Cost     :  $$##.## AC";PREMC:X=X+1
5190 LOCATE X,9:PRINT "Odds of Payoff   :    1 in";INT(1/PROBC):X=X+1
5200 LOCATE X,9:PRINT USING "Cash Flow Exp.   : $$###,###";CFXPC:X=X+1
5210 IF SELS = 10 THEN LOCATE Y,43:PRINT "ALL-RISK INSURANCE  :  NO":GOTO 5280:E
LSE LOCATE Y,43:PRINT "ALL-RISK INSURANCE   :  YES":
5220 Y=Y+2
5230 LOCATE Y,47:PRINT USING "Guaranteed Yield :   ### BU";GYS:Y=Y+1
5240 LOCATE Y,47:PRINT USING "Indemnity Price  :   $$#.##";IPS:Y=Y+1
5250 LOCATE Y,47:PRINT USING "Premium Cost     :  $$##.## AC";PREMS:Y=Y+1
5260 LOCATE Y,47:PRINT "Odds of Payoff   :    1 in";INT(1/PROBS):Y=Y+1
5270 LOCATE Y,47:PRINT USING "Cash Flow Exp.   : $$###,###";CFXPS:Y=Y+1
5280 LOCATE 1,4:PRINT; USERNAM$;TAB(28);"PRODUCTION AND MARKETING SUMMARY";TAB(6
5);"YEAR:";YEAR
5290 Y=Y+1
5300 GOSUB 6040:RETURN
5310 REM TEMP WORKFILE TO SCREEN DUMP OPTIMIUM INFO
5320 A=1:B=3
5330 CLS
5340 Y=10
5350 PRINT; USERNAM$;TAB(27);"GAMMA OPTIMIZATION MATRIX (";A;"thru";B;")";TAB(69
);"YEAR:";YEAR
5360 LOCATE 5,1:PRINT "EU#"
5370 REM LOCATE 6,1:PRINT "ACTEU"
5380 LOCATE 8,1:PRINT "R-BAR"
5390 LOCATE 10,1:PRINT "GAMMA"
5400 LOCATE 12,1:PRINT "AST.LR"
5410 LOCATE 13,1:PRINT "ASTP.IS"
5420 LOCATE 14,1:PRINT "ASTP.IRA"
5430 LOCATE 15,1:PRINT "ASTP.IO"
5440 LOCATE 16,1:PRINT "ASTP.LO"
5450 LOCATE 17,1:PRINT "TOTASTP"
5460 LOCATE 19,1:PRINT "VOL.LO"
5470 LOCATE 20,1:PRINT "VOL.LR"
5480 LOCATE 21,1:PRINT "VOL.I"
5490 LOCATE 22,1:PRINT "VOL.IT"
```

```
5500 LOCATE 23,1:PRINT "VOL.C"
5510 LOCATE 24,1:PRINT "TOTVOL";
5520 FOR I=A TO B
5530 IF I > IT THEN A=IT:GOTO 5720
5540 LOCATE 5,Y:PRINT OPT.EU#(I)
5550 REM LOCATE 6,Y:PRINT OPT.ACTEU#(I)
5560 REM LOCATE 8,Y:PRINT OPT.WRKFLE(I,1):REM  FLAG.TYPE
5565 LOCATE 8,Y:PRINT USING"      ##.###%";(OPT.WRKFLE(I,13)*100):REM  OPT.RBAR
5570 LOCATE 10,Y:PRINT USING"      ##.###%";(OPT.WRKFLE(I,2)*100):REM  GAMMA1S.I
5580 LOCATE 12,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,3):REM  ASSET.LR
5590 LOCATE 13,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,12):REM  MAXASSETP.IS
5600 LOCATE 14,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,4):REM  ASSETP.IRA
5610 LOCATE 15,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,5):REM  ASSETP.IO
5620 LOCATE 16,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,6):REM  ASSETP.LO
5630 LOCATE 17,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,6)+OPT.WRKFLE(I,5)+OPT.WR
KFLE(I,4)+OPT.WRKFLE(I,3)+OPT.WRKFLE(I,12)
5640 LOCATE 19,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,7):REM  VOLLIQU.LO
5650 LOCATE 20,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,8):REM  VOLLIQU.LR
5660 LOCATE 21,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,9):REM  VOLLIQU.I
5670 LOCATE 22,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,10):REM VOLLIQU.IT
5680 LOCATE 23,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,11):REM VOLLIQU.C
5690 LOCATE 24,Y:PRINT USING"$$#####,###";OPT.WRKFLE(I,11)+OPT.WRKFLE(I,10)+OPT.
WRKFLE(I,9)+OPT.WRKFLE(I,8)+OPT.WRKFLE(I,7);
5700 Y=Y+23
5710 NEXT I
5720 IF D1=10 THEN GOSUB 5980:A=A+3:B=B+3:GOTO 5770
5730 LOCATE 25,2:PRINT "MENU SELECTIONS  :   ";:COLOR 15:PRINT"< B >";:COLOR 7:P
RINT"ackward   ";:COLOR 15:PRINT"< F >";:COLOR 7:PRINT"orward   ";:COLOR 15:PRIN
T"< R >";:COLOR 7:PRINT"eturn   ";:COLOR 15:PRINT"< H >";:COLOR 7:PRINT"ard copy
";
5740 D$=INKEY$:IF INSTR(TEST2$,D$) < 2 THEN 5740
5750 D=INSTR(TEST2$,D$)
5760 IF D < 4 THEN RETURN:ELSE IF D < 6 THEN A=A-3:B=B-3:ELSE IF D < 8 THEN A=A+
3:B=B+3:ELSE IF D < 10 THEN GOSUB 5970:GOTO 5740
5770 IF A < 1 THEN D1=D1-1:RETURN 820:ELSE IF A > IT THEN D1=D1+1:RETURN 820
5780 GOTO 5330 : REM LOOP BACK TO CONTINUE
5790 REM HOUSEKEEPING CHORES TO TURN THE CORNER WITH
5800 REM INCREMENT CYCLE COUNTER
5805 CYCLE=CYCLE+1:IF CYCLES=CYCLE THEN GOTO 5806:ELSE GOTO 5811
5806 CLS:LOCATE 10,14:PRINT"THE SIMULATION PROCESS HAS BEEN COMPLETED!";
5807 LOCATE 12,14:PRINT"I HOPE YOU HAVE FOUND THIS EXERCISE USEFUL";:STOP
5811 REM READJUST BUDGET BOOK VALUES TO PRE-DISCOUNT VALUES
5812 FOR I=3 TO 5
5813 CCVE(C,I)=CCVE(C,I)*1/(1-DISFAC(I,ACRES)):SCVE(S,I)=SCVE(S,I)*1/(1-DISFAC(I
,ACRES))
5814 NEXT I
5816 CCVE(C,2)=TEMPCCVE(C,2):SCVE(S,2)=TEMPSCVE(S,2)
5817 REM SET LIQUIDATION COSTS AND CAPITAL PURCHASES TO FOR NEXT YEAR
5818 CAPINV=0:TROWCOST=0:RTROWCOST=0
5819 REM SET TEMPORARY VARIABLES TO ZERO FOR NEW YEAR
5820 INIASSET.LR=0:INIASSETP.IRA=0:INIASSETP.IO=0:INIASSETP.LO=0:INIVOLLIQU.IT=0
:INIMAXAS.IS=0:VOLLIQU.C=0:VOLLIQU.I=0:VOLLIQU.LR=0:VOLLIQU.LO=0
5822 ASSET.LR=0:ASSETP.IRA=0:ASSETP.IO=0:ASSETP.LO=0:VOLLIQU.IT=0:MAXASSETP.IS=0
:VOLLIQU.IT=0
5824 RENASSET.LR=0:RENASSETP.IRA=0:RENASSETP.IO=0:RENASSETP.LO=0:RENVOLLIQU.IT=0
:RENMAXAS.IS=0
5826 PURASSET.LR=0:PURASETP.IRA=0:PURASSETP.IO=0:PURASSETP.LO=0:PURVOLLIQU.IT=0:
PURMAXAS.IS=0
5828 VOLVOLLIQU.IT=0:VOLMAXAS.IS=0:VOLVOLLIQU.I=0:VOLVOLLIQU.LR=0:VOLVOLLIQU.C=0
:VOLVOLLIQU.LO=0
```

```
5834 REM RESET REFINANCE OPTION
5835 IF REFINANCE$="Y" OR REFINANCE$="y" THEN REFINYRS=REFINYRS-1:IF REFINYRS=0
THEN REFINANCE$="N"
5840 REM CHECK REFINCOST
5850 IF FLAG.REFINCOST = 1 THEN FLAG.REFINCOST=0:REFINCOST=0
5855 REFINCOST=0:FASSET.L=0:FORLIQDBT.L=0:FDBT.L=0:FASSET.I=0:FORLIQDBT.I=0:FDBT
.I=0
5860 REM IF REFINCOST < > 0 THEN FLAG.REFINCOST=1
5870 REM SET END OF PERIOD TAX CREDIT TO THE NEW BEGINING PERIOD TAX CREDIT
5875 REM BASED ON 1986 TAX LAW CHANGES, ITC CAN BE CARRIED FORWARD
5880 BAITC=EAITC
5881 REM ZERO OUT OPT.WRKFLE
5882 FOR I= 1 TO 16
5883 OPT.EU#(I)=0:OPT.ACTEU#(I)=0
5884 FOR J= 1 TO 13
5885 OPT.WRKFLE(I,J)=0
5886 NEXT J
5888 NEXT I
5890 REM RESET FLAG.RIS FOR MOD 4 STOCHASTIC PROCESSING
5892 FLAG.RIS=0
5895 REM ADJUST THE PREVIOUS CORN AND SOY YIELDS TO REFLECT CURRENT YIELDS
5900 FOR I=1 TO 4
5905 REM RESET FLAG.DECISION FOR NEXT YEAR
5906 FLAG.DECISION=4
5910 PCY(I)=PCY(I+1):PSY(I)=PSY(I+1)
5920 NEXT I
5925 REM UPDATING RENTAL RATE PER ACRE FOR NEXT CYCLE
5926 IF AO>0 THEN NRRPA=(PPPA/20+RRPA)/2 ELSE NRRPA=RRPA*(1+RRCR)
5930 PCY(I)=STOYC:PSY(I)=STOYS
5935 REM RESET CROP VARIABLES
5937 FCCP=0:FSCP=0
5938 REM CAP=50:SAP=50:FCCP=0:FSCP=0
5939 GOSUB 6100
5940 REM WE ARE READY TO TURN THE CORNER
5945 STOP
5950 CLS:LOCATE 11,20:PRINT "You Are Now Entering Cycle #";CYCLE;BYEAR+CYCLE-1;
5955 LOCATE 13,27:PRINT "Model Now Loading Module No. 1a"
5960 BEEP:CHAIN "MOD1A",,ALL
5970 REM HARD COPY SCREEN DUMP CODE
5975 REM hard copy code
5980 MACHINE.CODE$=CHR$(&HCD)+CHR$(&H5)+CHR$(&HCA)+CHR$(&H0)+CHR$(&H0)
5990 REM DEF SEG=&H1700
6000 LOCATION=VARPTR(MACHINE.CODE$)
6010 ADRESS=256*(PEEK(LOCATION+2))+PEEK(LOCATION+1)
6015 REM CODE=0
6020 CALL ADRESS
6030 RETURN
6040 IF D1=10 THEN GOSUB 5980:RETURN
6050 LOCATE 25,2:PRINT "MENU SELECTIONS  :   ";:COLOR 15:PRINT"< B >";:COLOR 7:P
RINT"ackward   ";:COLOR 15:PRINT"< F >";:COLOR 7:PRINT"orward   ";:COLOR 15:PRIN
T"< R >";:COLOR 7:PRINT"eturn   ";:COLOR 15:PRINT"< H >";:COLOR 7:PRINT"ard copy
";
6060 RETURN
6100 SSUMRED=0:SCSASSET.L=0:SCBASET.L=0:SASSET.L=0:SLIGSHT=0:SPAR=0:SVOLLRES=0:S
NETVOLL.L=0:SCCGT.L=0:SDBT.L=0:SCP.L=0:SLPDBT.L=0:STDBT.L=0:SEQTPOS.L=0:SEQTPOSM
.L=0:SCREDRESR.L=0:SCRDRESM.L=0:SASSET.PLR=0
6110 SNETVOLL.I=0:SASSET.I=0:SMEMV=0:SMECB=0:SMEBV=0:SACCDEP=0:SCCGT.I=0:SDBT.I=
0:SCP.I=0:SLPDBT.I=0:STDBT.I=0:SEQTPOS.I=0:SEQTPOSM.I=0:SCRDRESR.I=0:SCRDRESM.I=
0
6120 SPPDLEASE=0:SLEAPAY.C=0:SASSET.C=0:SDBT.C=0:STDBT.C=0:SEQTPOS.C=0:SEQTPOSM.
```

```
C=0:SMINEQTPOS.C=0:SCRDRESR.C=0:SCRDRESM.C=0:SAVAILASS.C=0:SCURRATIO=0
6130 STASSET.CB=0:STASSETS.M=0:STDBT.CB=0:STDBT.M=0:STEQTPOS.CB=0:STEQTPOS.M=0:S
INDBT.L=0:SINDBT.I=0:SINDBT.C=0:STASSETS.TA=0:TSCRDRESR.C=0:SCRDRESR.W=0:SCRDRES
M.W=0
6140 RETURN
```

```
10 REM ***************                MOD.6A             ***************
20 REM *************** DATE LAST UPDATED 8/11/88  ***************
30 REM *************** DATE LAST PRINTED 10/19/88 ***************
40 REM *************** TIME LAST PRINTED 10:00 AM ***************
60 REM $INCLUDE: 'MODCOM'
170 TASSET.C(STORE)=TASSET.C
180 ASSET.I(STORE)=ASSET.I
190 ASSET.L(STORE)=ASSET.L
200 TASSETS.M(STORE)=TASSETS.M
210 TDBT.C(STORE)=TDBT.C
220 TDBT.I(STORE)=TDBT.I
230 TDBT.L(STORE)=TDBT.L
240 TDBT.CB(STORE)=TDBT.CB
250 TDBT.M(STORE)=TDBT.M
260 TEQTPOS.M(STORE)=TEQTPOS.M
270 CRDRESR.C(STORE)=CRDRESR.C
275 CRDRESM.C(STORE)=CRDRESM.C
280 CRDRESR.I(STORE)=CRDRESR.I
285 CRDRESM.I(STORE)=CRDRESM.I
290 CRDRESR.L(STORE)=CRDRESR.L
295 CRDRESM.L(STORE)=CRDRESM.L
300 CRDRESR.W(STORE)=CRDRESR.W
305 CRDRESM.W(STORE)=CRDRESM.W
310 AO(STORE)=AO
320 AR(STORE)=AR
330 E0(STORE)=E0
340 E1(STORE)=E1
350 PRBBRY(STORE)=PRBBRY
360 MAXER.W(STORE)=MAXER.W
370 MAXEM.W(STORE)=MAXEM.W
380 ACFXPC(STORE)=CFXPC
390 ACFXPS(STORE)=CFXPS
400 CFXEXP(STORE)=CFXPC+CFXPS
410 VOLLIQMIN.C(STORE)=VOLLIQMIN.C
420 VOLLIQMIN.I(STORE)=VOLLIQMIN.I
430 VOLLIQMIN.IL(STORE)=VOLLIQMIN.IL
440 VOLLIQMIN.L(STORE)=VOLLIQMIN.L
450 VOLLIQMIN.LI(STORE)=VOLLIQMIN.LI
460 VOLLIQU.I(STORE)=VOLLIQU.I
470 VOLLIQU.IT(STORE)=VOLLIQU.IT
480 VOLLIQU.LO(STORE)=VOLLIQU.LO
490 VOLLIQU.LR(STORE)=VOLLIQU.LR
500 VOLLIQU.T(STORE)=VOLLIQU.T
510 FORLIQ.I(STORE)=FORLIQ.I
520 FORLIQ.L(STORE)=FORLIQ.L
530 ROWCOST(STORE)=ROWCOST
540 AVAILASS.C(STORE)=AVAILASS.C
550 GAMMA1S(STORE)=GAMMA1S
560 IN.C(STORE)=IN.C
570 IN.I(STORE)=IN.I
580 IN.L(STORE)=IN.L
590 ROW.C(STORE)=ROW.C
600 ROW.I(STORE)=ROW.I
610 ROW.L(STORE)=ROW.L
620 ROW.WE0(STORE)=ROW.WE0
630 DEL.C(STORE)=DEL.C
640 DEL.I(STORE)=DEL.I
```



```
650 DEL.L(STORE)=DEL.L
660 DEL.WE0(STORE)=DEL.WE0
670 CASHDP.C(STORE)=CASHDP.C
680 CASHDP.I(STORE)=CASHDP.I
690 CASHDP.L(STORE)=CASHDP.L
700 TERM.C(STORE)=TERM.C
710 TERM.I(STORE)=TERM.I
720 TERM.L(STORE)=TERM.L
730 MINCR.C(STORE)=MINCR.C
740 MINCR.I(STORE)=MINCR.I
750 MINCR.L(STORE)=MINCR.L
755 SUMMINCR(STORE)=SUMMINCR
760 PIPMT(STORE)=PIPMT
770 CAPINV(STORE)=CAPINV
780 CLS:LOCATE 11,30:PRINT "One Moment Please ...";
790 ON STORE GOTO 800,810,820,830
800 LOCATE 13,27:PRINT "Model Now Loading Module No. 2"
805 CHAIN "MOD2",,ALL
810 LOCATE 13,27:PRINT "Model Now Loading Module No. 3"
815 CHAIN "MOD3",,ALL
820 LOCATE 13,27:PRINT "Model Now Loading Module No. 5"
825 CHAIN "MOD5",,ALL
830 LOCATE 13,27:PRINT "Model Now Loading Module No. 6"
835 CHAIN "MOD6",,ALL
```

```
10 REM ***************              MODULE No.1A          ***************
20 REM *************** DATE LAST UPDATED 10/06/88 ***************
30 REM *************** DATE LAST PRINTED 10/20/88 ***************
40 REM *************** TIME LAST PRINTED 08:15 AM ***************
50 DEE$=" NnYy":YEAR=1988+CYCLE-1
60 REM $INCLUDE: 'MODCOM'
170 GOSUB   210:REM       CROP ACREAGE INPUT SUBROUTINE
180 GOSUB  570:REM      DETERMINISTIC INPUTS INITIALIZATION
185 CLS:LOCATE 9,27:PRINT "Model Now Loading Module No. 2"
190 LOCATE 11,30:PRINT "One Moment Please ...":BEEP:CHAIN "MOD2",,ALL
200 REM CROP ACREAGE INPUT SUBROUTINE
210 CLS
220 COLOR 15:PRINT TAB(21);"* * PRODUCTION AND MARKETING DATA * *"
230 PRINT:PRINT TAB(31);"CROPLAND ACREAGE":COLOR 7
240 PRINT:COLOR 15:PRINT"CURRENT TILLABLE ACREAGE :  ";:COLOR 7:PRINT"OWNED   ";
:PRINT USING"###,###";AO;:PRINT " (Alter in Optimal Decision Choice)"
250 PRINT TAB(29);"RENTED  ";:PRINT USING"###,###";AR
260 PRINT TAB(36);DASH$;DASH$
270 TOTA=AO+AR:PRINT TAB(29);"TOTAL  ";:PRINT USING"###,####";TOTA;:PRINT S10$
271 PRINT:PRINT TAB(10);USING"RENTAL RATE PER ACRE IN  ####  :$$###";YEAR-1,RRPA
272 PRINT TAB(10);USING     "RENTAL RATE PER ACRE FOR ####  :$$###";YEAR;ZERO
280 PRINT:COLOR 15:PRINT"DOES THE OPPORTUNITY EXIST FOR :":COLOR 7:PRINT
290 PRINT TAB(10);"PURCHASING ADDITIONAL TILLABLE LAND            "
300 PRINT:PRINT TAB(10);"PURCHASE PRICE PER ACRE              ";USING "$$#,###";P
PPA
310 PRINT TAB(10);"AVAILABLE ACREAGE AT ";:PRINT USING "$$#,###        ###,###";
PPPA;PAL
320 PRINT
330 PRINT TAB(10);"RENTING/LEASING ADDITIONAL TILLABLE LAND       "
350 PRINT:PRINT TAB(10);"AVAILABLE ACREAGE AT ";:PRINT USING "$$#,###        ###
,###";RRPA;RAL
360 LOCATE 24,1:PRINT S79$;:COLOR 15:LOCATE 24,20:PRINT "DO YOU WANT TO MAKE ANY
 CHANGES ?";:COLOR 7
370 D$=INKEY$ : IF INSTR(DEE$,D$) < 2 THEN 370
380 D=INSTR(DEE$,D$):IF D < 4 THEN PUR.STOP=.5*PPPA:REN.STOP=.5*RRPA:RETURN:ELSE
 LOCATE 24,1:PRINT S79$;
390 X=CSRLIN-18
400 LOCATE X,46:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,37:PRINT USING"###,###";V
AL(A$);:PRINT S20$:AR=VAL(A$):ELSE LOCATE X,46:PRINT;S20$
410 TOTA=AO+AR:LOCATE X+2,36:PRINT USING"####,###";TOTA
420 X=X+5
425 LOCATE X,49:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,42:PRINT USING "$$###";VA
L(A$);:PRINT S20$:RRPA=VAL(A$):ELSE LOCATE X,49:PRINT S20$;:GOTO 425
426 LOCATE 22,31:PRINT USING"$$#,###";RRPA
427 X=X+4
430 LOCATE X,46:INPUT "(Y/N) ?",A$
440 IF A$="N" OR A$="n" THEN PATL$="N":PAL=0:LOCATE X,46:COLOR 15:PRINT" NO";:CO
LOR 7:PRINT S20$:ELSE GOTO 460
450 X=X+2:LOCATE X,46:PRINT USING"$$#,###";PPPA:X=X+1:LOCATE X,31:PRINT USING"$$
#,###        ###,###";PPPA;PAL:GOTO 490
460 IF A$="Y" OR A$="y" THEN PATL$="Y":LOCATE X,46:COLOR 15:PRINT" YES";:COLOR 7
:PRINT S20$:ELSE LOCATE X,46:PRINT S20$:GOTO 430
470 X=X+2:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "$$#
,###";VAL(A$);:PRINT S20$:PPPA=VAL(A$):LOCATE X+1,31:PRINT USING"$$#,###";PPPA:E
LSE LOCATE X,55:PRINT;S20$
480 X=X+1:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "###
,###";VAL(A$);:PRINT S20$:PAL=VAL(A$):ELSE LOCATE X,55:PRINT;S20$
```

```
490 X=X+2
500 LOCATE X,51:INPUT "(Y/N) ?",A$
510 IF A$="N" OR A$="n" THEN RLTL$="N":RAL=0:LOCATE X,51:COLOR 15:PRINT" NO";:CO
LOR 7:PRINT S20$:ELSE GOTO 530
520 X=X+2:LOCATE X,31:PRINT USING"$$#,###          ###,###";RRPA;RAL:GOTO 560
530 IF A$="Y" OR A$="y" THEN RLTL$="Y":LOCATE X,51:COLOR 15:PRINT" YES";:COLOR 7
:PRINT S20$:ELSE LOCATE X,51:PRINT S20$:GOTO 500
550 X=X+2:LOCATE X,55:INPUT "=> ",A$:IF A$<>"" THEN LOCATE X,46:PRINT USING "###
,###";VAL(A$);:PRINT S20$:RAL=VAL(A$):ELSE LOCATE X,55:PRINT;S20$
560 GOTO 360
570 REM DETERMINISTIC INPUT SUBROUTINE
580 CLS:WIDTH 80:PRINT TAB(15);:COLOR 15:PRINT"ADJUSTED DETERMINISTIC INPUTS : M
ARKET BASIS VALUE":COLOR 7:PRINT
590 REM SET CURSOR CONTROLS
592 S39$=STRING$(39,32)
594 S79$=STRING$(79,32)
600 INI.X=CSRLIN:INI.Y=POS(0):GOTO 1210
610 IF FLAG0=1 THEN ASSET.C=VAL(I$)
620 PRINT" ASSET.C  = ";USING "$$####,### ";ASSET.C;:PRINT S5$;:RETURN
630 IF FLAG0=1 THEN ASSET.I=VAL(I$)
640 PRINT" ASSET.I  = ";USING "$$####,### ";ASSET.I;:PRINT S5$;:RETURN
650 IF FLAG0=1 THEN ASSET.L=VAL(I$)
660 PRINT" ASSET.L  = ";USING "$$####,### ";ASSET.L:RETURN
670 IF FLAG0=1 THEN BAITC=VAL(I$)
680 PRINT" BAITC    = ";USING "$$####,### ";BAITC;:PRINT S5$;:RETURN
690 IF FLAG0=1 THEN MEBV#=VAL(I$)
700 PRINT" MACH.BV  = ";USING "$$####,### ";MEBV;:PRINT S5$;:RETURN
710 IF FLAG0=1 THEN CBASET.L=VAL(I$)
720 PRINT" CBASET.L = ";USING "$$####,### ";CBASET.L:RETURN
730 IF FLAG0=1 THEN DBT.C=VAL(I$)
740 PRINT" DEBT.C   = ";USING "$$####,### ";DBT.C;:PRINT S5$;:RETURN
750 IF FLAG0=1 THEN DBT.I=VAL(I$)
760 PRINT" DEBT.I   = ";USING "$$####,### ";DBT.I;:PRINT S5$;:RETURN
770 IF FLAG0=1 THEN DBT.L=VAL(I$)
780 PRINT" DEBT.L   = ";USING "$$####,### ";DBT.L:RETURN
790 IF FLAG0=1 THEN ROW.C=VAL(I$)/100
800 PRINT" ROW.C    = ";USING "   ##.## % ";ROW.C*100;:PRINT S5$;:RETURN
810 IF FLAG0=1 THEN ROW.I=VAL(I$)/100
820 PRINT" ROW.I    = ";USING "   ##.## % ";ROW.I*100;:PRINT S5$;:RETURN
830 IF FLAG0=1 THEN ROW.L=VAL(I$)/100;PRINT S5$;:RETURN
840 PRINT" ROW.L    = ";USING "   ##.## % ";ROW.L*100:RETURN
850 IF FLAG0=1 THEN DEL.C=VAL(I$)/100
860 PRINT" DEL.C    = ";USING "   ##.## % ";DEL.C*100;:PRINT S5$;:RETURN
870 IF FLAG0=1 THEN DEL.I=VAL(I$)/100
880 PRINT" DEL.I    = ";USING "   ##.## % ";DEL.I*100;:PRINT S5$;:RETURN
890 IF FLAG0=1 THEN DEL.L=VAL(I$)/100
900 PRINT" DEL.L    = ";USING "   ##.## % ";DEL.L*100:RETURN
910 IF FLAG0=1 THEN IN.C=VAL(I$)/100
920 PRINT" IN.C     = ";USING "   ##.## % ";IN.C*100;:PRINT S5$;:RETURN
930 IF FLAG0=1 THEN IN.I=VAL(I$)/100
940 PRINT" IN.I     = ";USING "   ##.## % ";IN.I*100;:PRINT S5$;:RETURN
950 IF FLAG0=1 THEN IN.L=VAL(I$)/100
960 PRINT" IN.L     = ";USING "   ##.## % ";IN.L*100:RETURN
970 IF FLAG0=1 THEN MINCR.C=VAL(I$)
980 PRINT" MINCR.C  = ";USING "$$####,### ";MINCR.C;:PRINT S5$;:RETURN
990 IF FLAG0=1 THEN MINCR.I=VAL(I$)
1000 PRINT" MINCR.I  = ";USING "$$####,### ";MINCR.I;:PRINT S5$;:RETURN
1010 IF FLAG0=1 THEN MINCR.L=VAL(I$)
1020 PRINT" MINCR.L  = ";USING "$$####,### ";MINCR.L:RETURN
1030 IF FLAG0=1 THEN CASHDP.C=VAL(I$)/100
```

```
1040 PRINT" CASHDP.C =_";USING "    ##.## % ";CASHDP.C*100;:PRINT S5$;:RETURN
1050 IF FLAG0=1 THEN CASHDP.I=VAL(I$)/100
1060 PRINT" CASHDP.I = ";USING "    ##.## % ";CASHDP.I*100;:PRINT S5$;:RETURN
1070 IF FLAG0=1 THEN CASHDP.L=VAL(I$)/100
1080 PRINT" CASHDP.L = ";USING "    ##.## % ";CASHDP.L*100:RETURN
1090 IF FLAG0=1 THEN TERM.C=VAL(I$)
1100 PRINT" TERM.C    = ";USING "       ##.# ";TERM.C;:PRINT S5$;:RETURN
1110 IF FLAG0=1 THEN TERM.I=VAL(I$)
1120 PRINT" TERM.I    = ";USING "       ##.# ";TERM.I;:PRINT S5$;:RETURN
1130 IF FLAG0=1 THEN TERM.L=VAL(I$)
1140 PRINT" TERM.L    = ";USING "       ##.# ";TERM.L;:PRINT:RETURN
1150 IF FLAG0=1 THEN RFRR=VAL(I$)/100
1160 PRINT" RFRR      = ";USING "    ##.## % ";RFRR*100;:PRINT S5$;:RETURN
1170 IF FLAG0=1 THEN NONFINC=VAL(I$)
1180 PRINT" NONFINC   = ";USING "$$####,### ";NONFINC;:PRINT S5$;:RETURN
1190 IF FLAG0=1 THEN CASHOUT=VAL(I$)
1200 PRINT" CASHOUT   = ";USING "$$####,### ";CASHOUT;:PRINT:RETURN
1210 Y=0
1220 FOR I=1 TO 3:Y=Y+1
1230 ON Y GOSUB 620,640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860,
880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 11
60, 1180, 1200
1240 NEXT I
1250 PRINT
1260 IF Y<> 30 THEN 1220
1270 IF CYCLE =1 THEN 1310
1280 LOCATE 23,1:PRINT S79$;:LOCATE 23,17:COLOR 15:PRINT"    DO YOU WANT TO MAKE
 ANY CHANGES ?          ":COLOR 7
1290 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1290: ELSE D=INSTR(DEE$,D$)
1300 IF D < 4 THEN RETURN:ELSE LOCATE 23,1:PRINT S79$;
1310 JLOOP=1:NEW.X=INI.X:NEW.Y=INI.Y:L=0
1320 IF JLOOP>10 THEN 1280
1330 IF JLOOP>1 THEN L=L+3
1340 LOCATE NEW.X,NEW.Y:COLOR 0,7
1350 FOR K=1 TO 3
1360 ON K+L GOSUB 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 86
0, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140,
 1160, 1180, 1200
1370 NEXT K
1380 COLOR 15,0
1390 LOCATE 23,18:PRINT"DO YOU WANT TO MAKE ANY CHANGES ON THIS LINE ?":COLOR 7
1400 D$=INKEY$:IF INSTR(DEE$,D$) < 2 THEN 1400:ELSE D=INSTR(DEE$,D$)
1410 LOCATE NEW.X,NEW.Y
1420 FOR K=1 TO 3
1430 ON K+L GOSUB 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 86
0, 880, 900, 920, 940, 960, 980, 1000, 1020,1040,1060,1080,1100,1120,1140,1160,1
180,1200
1440 NEXT K
1450 IF D < 4 THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):JLOOP=JLOOP+1:GOTO 1320
1460 FOR I=L+1 TO L+3
1470 COLOR 0,7
1480 LOCATE NEW.X,NEW.Y
1490 OLD.X=NEW.X:OLD.Y=NEW.Y
1500 ON I GOSUB 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860,
 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1
160, 1180, 1200
1510 IF I=L+3 THEN NEW.X=CSRLIN+1:NEW.Y=POS(0):ELSE NEW.X=CSRLIN:NEW.Y=POS(0)
1520 LOCATE 23,1
1530 COLOR 7,0:PRINT S79$;:COLOR 0,7
1540 LOCATE 23,23:PRINT S39$;:LOCATE 23,24
```

```
1550 FLAGO=1
1560 ON I GOSUB 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860,
 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1
160, 1180, 1200
1570 LOCATE 23,47:INPUT" => ",I$
1580 IF LEN(I$)=0 THEN FLAGO=0:ELSE FLAGO=1
1590 COLOR 7,0:LOCATE 22,1:PRINT S79$
1600 LOCATE OLD.X,OLD.Y
1610 ON I GOSUB 610, 630, 650, 670, 690, 710, 730, 750, 770, 790, 810, 830, 850,
 870, 890, 910, 930, 950, 970, 990, 1010, 1030, 1050, 1070, 1090, 1110, 1130, 11
50, 1170, 1190
1620 FLAGO=0
1630 NEXT I
1640 JLOOP=JLOOP+1:GOTO 1320
```

APPENDIX C

Paul and Mary Dalton

Initial Balance Sheet-January 1, 1988 — Page 1

ASSETS		MODIFIED COST	MARKET VALUE
CURRENT ASSETS			
- Cash / Cash Equivalent		$88,244	$88,244
- Prepaid Land Lease		24,000	24,000
TOTAL CURRENT ASSETS		$112,244	$112,244
INTERMEDIATE ASSETS			
- Machinery and Bldg			
- Cost Basis	$335,910		$303,780
- Acc. Deprec.	42,792		
- Book Value		$293,118	
TOTAL INTERMEDIATE ASSETS		$293,188	$303,780
LAND (acres= 600)		$240,000	$540,000
TOTAL VALUE OWNED ASSETS		$645,342	$956,024
MARKET VALUE of RENTED LAND (acres= 600)		N/A	$540,000
TOTAL VALUE OF RENTED & OWNED ASSETS		$645,362	$1,496,024

Initial Balance Sheet-January 1, 1988 — Page 2

LIABILITIES AND NET WORTH	MODIFIED COST	MARKET VALUE
CURRENT LIABILITIES		
- Operating Loan (12 mos. or less)	$37,000	$37,000
- Current Portion of intermediate loan	25,405	25,405
- Current Portion of Long-Term Loan	7,500	7,500
- Land Lease Payable	12,000	12,000
TOTAL CURRENT LIABILITIES	$81,905	$81,905
INTERMEDIATE LIABILITIES		
- Machinery/Bldg Loan	$101,619	$101,619
- Contingent Tax on Intermed. Assets	N/A	1,599
TOTAL INTERMEDIATE LIABILITIES	$101,619	$103,218
LONG-TERM LIABILITIES		
- Real Estate Mortgage	$142,500	$142,500
- Contingent Tax on Land	N/A	45,000
TOTAL LONG-TERM LIABILITIES	$142,500	$187,500
TOTAL LIABILITIES	$326,024	$372,623
NET WORTH	$319,338	$583,401

Table C-1 Initial Balance Sheet: January 1, 1988

Paul and Mary Dalton

Initial Balance Sheet-January 1, 1988 Page 3

CREDIT RESERVE SUMMARY INFORMATION

MAXER.W	$288,731	MAXEM.W	$396,078
CRDRESR.C	$251,409	CRDRESM.C	$1,152,638
CRDRESR.I	$373,785	CRDRESM.I	$863,931
CRDRESR.L	$630,000	CRDRESM.L	$1,185,000
CRDRESR.W	$ 942,694	CRDRESM.W	$2,422,070

Table C-2 Initial Credit Reserve Summary: January 1, 1988

SUMMARY INFORMATION: 1988

CORN	SOYBEANS
480 ACRES (40% TOTAL)	720 ACRES (60% TOTAL)
EXPECTED PRICE: $2.64	EXPECTED PRICE: $9.01
EXPECTED YIELD (bushels): 125	EXPECTED YIELD: (bushels): 41
CASH VARIABLE EXPENSE PER ACRE:. $213.20	CASH VARIABLE EXPENSE PER ACRE $106.90
GROSS MARGIN PER ACRE: $116.80	GROSS MARGIN PER ACRE $262.51
FORWARD CONTRACT PERCENT: 50%	FORWARD CONTRACT PERCENT: 50%
ALL-RISK INSURANCE: YES	ALL-RISK INSURANCE: YES
Guaranteed Yield: 78 Bu.	Guaranteed Yield: 26 Bu.
Indemnity Price: $2.64	Indemnity Price: $6.31
Premium Cost: $7.76 per Acre	Premium Cost: $5.43 per Acre
Odds of Payoff: 1 in 11	Odds of Payoff: 1 in 11
Cash Flow Exposure: -$44,293	Cash Flow Exposure: $33,425

Table C-3 Crop Production and Marketing Summary For Planning: 1988

ALL-RISK INSURANCE TABLE: CORN

BREAK-EVEN YIELD TO CONSIDER HARVEST WITH MAXIMUM INSURANCE COVERAGE: 41 Bushels

SELECTION	GUARANTEED YIELD	INDEMNITY PRICE	PREMIUM COST	ODDS OF PAYOFF	CASH FLOW EXPOSURE
1	60 Bu.	$1.85	$4.07/acre	1 in 72	-$65,895
2	60 Bu.	$2.25	$4.94/acre	1 in 72	-$66,143
3	60 Bu.	$2.64	$5.82/acre	1 in 72	-$66,391
4	78 Bu.	$1.85	$5.09/acre	1 in 11	-$43,578
5	78 Bu.	$2.25	$6.18/acre	1 in 11	-$43,936
6	78 Bu.	$2.64	$7.27/acre	1 in 11	-$44,293
7	90 Bu.	$1.85	$10.47/acre	1 in 5	-$31,064
8	90 Bu.	$2.25	$12.72/acre	1 in 5	-$32,001
9	90 Bu.	$2.64	$14.96/acre	1 in 5	-$32,938
10	NO INSURANCE COVERAGE CASH FLOW EXPOSURE 100% CROP FAILURE:				-$83,610

ENTER YOUR INSURANCE SELECTION NUMBER (1-10) __

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Table C-4 All-Risk Crop Insurance Summary Table For Corn: 1988

ALL-RISK INSURANCE TABLE: SOYBEANS

BREAK-EVEN YIELD TO CONSIDER HARVEST WITH MAXIMUM INSURANCE COVERAGE: 5 Bushels

SELECTION	GUARANTEED YIELD	INDEMNITY PRICE	PREMIUM COST	ODDS OF PAYOFF	CASH FLOW EXPOSURE
1	20 Bu.	$6.31	$3.16/acre	1 in 72	-$3,802
2	20 Bu.	$7.66	$3.84/acre	1 in 72	-$3,339
3	20 Bu.	$9.01	$4.51/acre	1 in 72	-$2,875
4	26 Bu.	$6.31	$5.43/acre	1 in 11	$33,425
5	26 Bu.	$7.66	$6.59/acre	1 in 11	$33,522
6	26 Bu.	$9.01	$7.76/acre	1 in 11	$33,619
7	30 Bu.	$6.31	$9.03/acre	1 in 5	$56,671
8	30 Bu.	$7.66	$10.96/acre	1 in 5	$56,187
9	30 Bu.	$9.01	$12.90/acre	1 in 5	$55,703
10	NO INSURANCE COVERAGE CASH FLOW EXPOSURE 100% CROP FAILURE:				-$102,758

ENTER YOUR INSURANCE SELECTION NUMBER (1-10) __

Table C-5 All-Risk Crop Insurance Summary Table For Soybeans: 1988

Paul and Mary Dalton

End of Period Balance Sheet: December 31, 1988 — Page 1

ASSETS		MODIFIED COST	MARKET VALUE
CURRENT ASSETS			
- Cash / Cash Equivalent		$89,581	$89,581
- Prepaid Land Lease		0	0
TOTAL CURRENT ASSETS		$89,581	$89,581
INTERMEDIATE ASSETS			
- Machinery and Bldg			
- Cost Basis	$335,910		$267,109
- Acc. Deprec.	79,463		
- Book Value		$256,447	
TOTAL INTERMEDIATE ASSETS		$210,284	$267,109
LAND (acres= 600)		$240,000	$605,347
TOTAL OWNED ASSETS		$586,027	$962,036
MARKET VALUE of RENTED LAND (acres= 600)		N/A	$605,347
TOTAL VALUE OF RENTED & OWNED ASSETS		$586,027	$1,567,383

End of Period Balance Sheet: December 31, 1988 — Page 2

LIABILITIES AND NET WORTH	MODIFIED COST	MARKET VALUE
CURRENT LIABILITIES		
- Operating Loan (12 mos. or less)	$23,644	$23,644
- Current Portion of intermediate loan	20,324	20,324
- Current Portion of Long-Term Loan	7,125	7,125
- Land Lease Payable	7,500	7,500
TOTAL CURRENT LIABILITIES	$51,112	$51,112
INTERMEDIATE LIABILITIES		
- Machinery/Bldg Loan	$81,295	$81,295
- Contingent Tax on Intermed. Assets	N/A	1,599
TOTAL INTERMEDIATE LIABILITIES	$81,295	$82,894
LONG-TERM LIABILITIES		
- Real Estate Mortgage	$135,375	$190,000
- Contingent Tax on Land	N/A	54,802
TOTAL LONG-TERM LIABILITIES	$135,375	$190,177
TOTAL LIABILITIES	$267,782	$324,184
NET WORTH	$318,245	$637,852

Table C-6 End of Period Balance Sheet: December 31, 1988

Paul and Mary Dalton

End of Period Balance Sheet: December 31, 1988 Page 3

CREDIT RESERVE SUMMARY INFORMATION

MAXER.W	$343,872	MAXEM.W	$449,730
CRDRESR.C	$289,443	CRDRESM.C	$1,228,761
CRDRESR.I	$367,268	CRDRESM.I	$825,494
CRDRESR.L	$783,194	CRDRESM.L	$1,434,877
CRDRESR.W	$1,131,813	CRDRESM.W	$2,730,007

Table C-7 End of Period Credit Reserve Summary: December 31, 1988

Paul and Mary Dalton Balance Sheet Summary Year: 1988

Category	12/31/87	1/1/88a	1/1/88b	12/31/88
CURRENT ASSETS	$119,000	$112,244	$112,244	$ 89,581
INTMED. ASSETS	270,000	303,780	303,780	267,109
LONG TERM ASSETS	540,000	540,000	540,000	540,000
TOTAL ASSETS	$929,000	$956,024	$956,024	$962,036
CURRENT LIAB	$ 76,500	$ 81,905	$ 81,905	$ 51,112
INTMED LIAB	81,599	103,218	103,218	82,894
LONG TERM LIAB	187,500	187,500	187,500	190,177
TOTAL LIAB	$345,599	$372,623	$372,623	$324,184
NET WORTH	$583,401	$583,401	$583,401	$637,852
RESTRICTED-CUR	$283,500	$251,409	$251,409	$289,443
RESTRICTED-INT	381,667	373,785	373,785	367,268
RESTRICTED-LON	630,000	630,000	630,000	783,194
RESTRICTED-WGT	$968,080	$942,694	$1,001,896	$1,131,813
CURRENT RATIO	1.56:1	1.37:1	1.37:1	1.75:1
DEBT/EQUITY	0.59:1	0.64:1	0.64:1	0.51:1
PERCENT EQUITY	62.0%	61.0%	61.0%	66.0%
OWNED ACREAGE	600	600	600	600
RENTAL ACREAGE	600	600	600	600
RENT/OWN %	50.0%	50.0%	50.0%	50.0%

a) Before Investment Decisions Are Made
b) After Investment Decisions Are Made

Table C-8 Balance Sheet Summary Report: 1988

Paul and Mary Dalton Financial Management Summary Year: 1988

Category	12/31/87	1/1/88	1/1/88	12/31/88
CREDIT RESERVES:				
RESTRICTED-CUR	$283,500	$251,409	$251,409	$289,443
RESTRICTED-INT	381,667	373,785	373,785	367,268
RESTRICTED-LOW	630,000	630,000	630,000	783,194
RESTRICTED-WGT	$968,080	$942,694	$1,001,896	$1,131,813
MEASURES OF RISK:				
E0	0.00	0.00	-0.66	-0.53
E1	0.00	0.00	-0.55	-0.41
PROBABILITY OF BANKRUPTCY	0.00%	0.00%	0.00%	0.00%
CASH FLOW MEASURES:				
CASH FLOW TO EXHAUST RESTRICTED CREDIT	$296,787	$288,731	$297,641	$343,872
CASH FLOW TO RESULT IN BANKRUPTCY	$401,898	$396,078	$403,295	$449,730
CASH FLOW EXPOS-CORN	$0	$0	-$44,293	-$38,103
CASH FLOW EXPOS-SOY	$0	$0	$33,425	$40,033
FINANCIAL MEASURES:				
TOTAL ASSET PURCHASE	$0	$33,780	$0	$0
CURRENT/TOTAL DEBT	22.00%	21.00%	21.00%	15.00%
INTERMED/TOTAL DEBT	23.00%	27.00%	27.00%	25.00
L-TERM LIAB/TOTAL DEBT	54.00%	50.00%	50.00%	58.00%
SCHEDULED REPAYMENT	$53,475	$61,542	$61,542	$52,777

Table C-9 Financial Management Summary Report: 1988

Paul and Mary Dalton **Income Statement** Summary Yaer: 1988

Paul and Mary Dalton Cash Flow Summary Report Yaer: 1988

Revenue:		
Crop Sales		$ 291,694
Other Farm Income		7,077
Total Farm Revenue		$ 298,771
Expenses:		
Hired Labor	$22,392	
Repairs	18,955	
Operating Loan Interest	13,030	
Rent	24,000	
Crop Expenses	122,394	
Land taxes & Insurance	18,500	
Miscellaneous	1,500	
Depreciation	36,671	
Total Operating Expenses		$257,443
Intermediate & Long Term Interest		-28,636
Income From Farm Operations		$12,690
Asset Liquidation Expenses . . .	- $ 0	
Gain (Loss) from Sale of Assets	0	
Net Farm Income Before Taxes		$12,690
Gross Non-Farm Income	+ $20,000	
Taxes & Social Security less ITC	- 4,585	
Net Income After Tax		$28,105

Table C-10 Income Statement Report: 1988

Paul and Mary Dalton Cash Flow Summary Report Yaer: 1988

SOURCES OF CASH:

Cash Receipts From Operations	$ 291,694
Other Farm Income	7,077
Capital Asset Sales	0
Non-Farm Income	20,000
New Intermediate & Long Term Debt	27,023
TOTAL CASH AVAILABLE	$ 345,795

USES OF CASH:

Total Cash Operating Expenses	$221,407
Capital Asset Purchases	33,779
Intermediate & Long Term P & I Payments .	61,541
Taxes and Social Security	4,585
Family Living Withdrawal	16,808
Non-Farm Cash Withdrawal	5,000
Asset Liquidation Expenses	0
TOTAL CASH REQUIRED	$343,121
NET CASH FLOW (DEFICIT)	$2,674
FORCED ASSET LIQUIDATION	$0

Table C-11 Cash Flow Summary Report: 1988

Paul and Mary Dalton Operational Summary Report Year: 1988

Category	12/31/87	1/1/88	1/1/88	12/31/88
ASSET LIQUIDATION TO BAL. CREDIT RESERVES				
CURRENT ASSET	$0	$0	$0	$0
MACHINERY	0	0	0	0
LAND TO BAL. M/E . . .	0	0	0	0
LAND	0	0	0	0
M/E TO BAL. LAND . . .	0	0	0	0
ASSETS LIQUIDATED DURING OPTIMIZATION				
MACHINERY	$0	$0	$0	$0
M/E DURING GAMMA ITERATION SEARCH . . .	0	0	0	0
OWNED LAND DURING OPTIMIZATION	0	0	0	0
TERMINATE LEASE ON RENTAL ACREAGE	0	0	0	0
TOTAL ASSETS SOLD OR TERMINATE LEASE . .	0	0	0	0
FORCED ASSET SALE				
MACHINERY	$0	$0	$0	$0
REAL ESTATE	0	0	0	0
TOTAL ASSETS	0	0	0	0
OTHER KEY MEASURES				
TOTAL LIQUIDATION COSTS	$0	$0	$0	$0
AVAILABLE CASH	$43,884	$35,990	$35,990	$50,213
M/E TO LAND RATIO	25.0	28.1	28.1	22.1
RISK AVERSION COEFF. (LAMDA)	0.0000601	0.0000601	0.0000601	0.0000601

Table C-12 Operational Summary Report: 1988

Paul and Mary Dalton Lender Credit Variable Report Year: 1988

Category	12/31/87	1/1/88	1/1/88	12/31/88
INTEREST RATES:				
CURRENT	9.25%	9.25%	9.25%	9.25%
INTERMEDIATE	9.85%	9.85%	9.85%	9.85%
LONG TERM	10.75%	10.75%	10.75%	10.75%
LIQUIDITY PREMIUM:				
CURRENT	5.00%	5.00%	5.00%	5.00%
INTERMEDIATE	15.00%	15.00%	15.00%	15.00%
LONG TERM	25.00%	25.00%	25.00%	25.00%
WEIGHTED	17.21%	17.27%	16.65%	17.28%
CREDIT VARIABLES:				
CURRENT	0.75	0.75	0.75	0.75
INTERMEDIATE	0.50	0.50	0.50	0.50
LONG TERM	0.50	0.50	0.50	0.50
WEIGHTED	0.53	0.53	0.53	0.53
CASH DOWNPAYMENT %				
CURRENT	5.00%	5.00%	5.00%	5.00%
MACHINERY	20.00%	15.00%	15.00%	15.00%
REAL ESTATE	20.00%	20.00%	20.00%	20.00%
TERM OF LOAN (years):				
CURRENT	1.0	1.0	1.0	1.0
INTERMEDIATE	5.0	5.0	5.0	5.0
LONG TERM	20.0	20.0	20.0	20.0
MINIMUM CREDIT RESERVE REQUIREMENT				
CURRENT	$1,000	$1,000	$1,000	$1,000
INTERMEDIATE	1,000	1,000	1,000	1,000
LONG TERM	1,000	1,000	1,000	1,000

Table C-13 Lender Credit Variable Summary Report: 1988

Paul and Mary Dalton Production and Marketing Summary Year: 1988

CORN	SOYBEANS
480 ACRES (40% TOTAL)	720 ACRES (60% TOTAL)
ACTUAL PRICE RECEIVED: $2.58	ACTUAL PRICE RECEIVED: $9.09
ACTUAL YIELD (bushels): 103	ACTUAL YIELD (bushels): 25
CASH VARIABLE EXPENSE PER ACRE:. $200.87	CASH VARIABLE EXPENSE PER ACRE . . . . . $ 98.13
GROSS MARGIN PER ACRE: $ 46.71	GROSS MARGIN PER ACRE $135.17
FORWARD CONTRACT PERCENT: 50%	FORWARD CONTRACT PERCENT: 50%
ALL-RISK INSURANCE: YES	ALL-RISK INSURANCE: YES
Guaranteed Yield: 78 Bu.	Guaranteed Yield: 26 Bu.
Indemnity Price: $2.64	Indemnity Price: $6.31
Premium Cost: $7.27 per Acre	Premium Cost: $5.43 per Acre
Odds of Payoff: 1 in 11	Odds of Payoff: 1 in 11
Cash Flow Exposure: -$38,103	Cash Flow Exposure: $40,033

Table C-14 Actual Crop Production and Marketing Results: 1988

Paul and Mary Dalton	Gamma Optimization Matrix (1 thru 3)		Year: 1988
EU#	6.108930849937815D-26	-1.779600759959977D-23	-2.408946158514258D-23
R-BAR	25.9%	8.46%	11.50%
GAMMA	28.128%	15.00%	17.50%
RENTAL LAND	$0	$0	$0
M/E FOR GAMMA	$0	$0	$0
M/E FOR RENTAL R/E	$0	$0	$0
M/E FOR PUR. R/E	$0	$0	$0
PURCHASE LAND	$0	$0	$0
TOTAL PURCHASED	$0	$0	$0
SELL OWNED LAND	$0	$102,681	$100,517
RELEASE RENTAL	$0	102,681	100,517
SELL M/E	$0	30,804	35,181
SELL M/E FOR GAMMA	$0	141,780	114,780
PPDLEASE	$0	4,564	4 467
TOTAL LIQUIDATED	$0	382,510	355,462

Table C-15 Gamma Optimization Matrix Summary Report: 1988

Paul and Mary Dalton	Gamma Optimization Matrix (4 thru 6)		Year: 1988
EU#	-1.471020040608659D-21	-1.568214118897152D-23	-4.810119783148896D-24
R-BAR	16.56%	21.25%	25.15%
GAMMA	20.000%	22.500%	25.00%
RENTAL LAND	$0	$0	$0
M/E FOR GAMMA	$0	$0	$0
M/E FOR RENTAL R/E	$0	$0	$0
M/E FOR PUR. R/E	$0	$0	$0
PURCHASE LAND	$0	$0	$0
TOTAL PURCHASED	$0	$0	$0
SELL OWNED R/E	$0	$0	$0
RELEASE RENTAL	$0	$0	$0
SELL M/E	$0	$0	$0
M/E-GAMMA	$87,780	$60,780	$33,780
PPDLEASE	$0	$0	$0
TOT LIQUID.	$87,780	$60,780	$33,780

Table C-15 Gamma Optimization Matrix Summary Report: 1988

Paul and Mary Dalton	Gamma Optimization Matrix (7 thru 9)	Year: 1988
EU# -1.660565923930539D-22	-3.995467589631083D-23	-4.549577917912957D-23
R-BAR 20.81%	20.96%	22.45%
GAMMA 27.50%	30.00%	32.50%
RENTAL LAND $0	$0	$0
M/E FOR GAMMA $0	$20,220	$47,220
M/E FOR RENTAL R/E $0	$0	$0
M/E FOR PUR. R/E $0	$0	$0
PURCHASE LAND $0	$0	$0
TOTAL PUR. ASSETS $0	$20,220	$47,220
SELL OWNED R/E $0	$0	$0
RELEASE RENTAL $0	$0	$0
SELL M/E $0	$0	$0
M/E-GAMMA $6,780	$0	$0
PPDLEASE $0	$0	$0
TOT LIQUID. $6,780	$0	$0

Table C-15 Gamma Optimization Matrix Summary Report: 1988

Paul and Mary Dalton	Gamma Optimization Matrix (10 thru 12)		Year: 1988
EU#	-3.287560624240871D-22	-2.065905441033996D-22	-1.307059544492499D-22
R-BAR	21.75%	20.99%	24.44%
GAMMA	35.00%	37.50%	40.00%
RENTAL LAND	$0	$0	$0
M/E FOR GAMMA	$74,221	$101,220	$128,220
M/E- RENTAL R/E	$0	$0	$0
M/E FOR PUR R/E	$0	$0	$0
PURCHASE R/E	$0	$0	$0
TOT PUR. ASSET	84,221	$101,220	$128,220
SELL OWNED R/E	$0	$0	$0
RELEASE RENTAL	$0	$0	$0
SELL M/E	$0	$0	$0
M/E-GAMMA	$0	$0	$0
PPDLEASE	$0	$0	$0
TOT LIQUID.	$0	$0	$0

Table C-15 Gamma Optimization Matrix Summary Report: 1988

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