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STRATEGIES AND THE MANAGEMENT
OF A PORTFOLIO OF BUSINESS UNITS

by

DONALD LELAND POPE


A thesis submitted in partial fulfillment of the
requirements for the degree of

DOCTOR OF PHILOSOPHY
in
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TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

The members of the Committee approve the thesis of
Donald Leland Pope presented August 5, 1974.



Lewis N. Goslin, Chairman



Harold A. Linstone


Roger L. Moseley


Robert W. Rempfer

APPROVED:


Harold A. Linstone, Head, Systems Science PhD Program


David T. Clark, Dean of Graduate Studies and Research

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APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

[REDACTED]

Lewis N. Goslin, Chairman

[REDACTED]

Harold A. Linstone

[REDACTED]

Roger L. Moseley

[REDACTED]

Robert W. Rempfer

The dissertation deals with the allocation of resources, among profit producing elements within a company, to achieve satisfactory results over a planning horizon. The company is viewed as a confederation of profit making elements called Strategic Business Units (SBU) which are independent of each other and held together by a central authority. The dissertation uses a computerized simulation model of the deterministic type in a time-

sharing mode. The model is deterministic with some limited probabilistic effects. It is used to develop projected balance sheets and profit and loss statements for each period in a predetermined planning horizon and to evaluate the success of a set of alternative futures of the SBU. The set of SBU alternatives to be evaluated as the "company" may be arbitrarily chosen by the operator or chosen through the use of a near-optimal, integer programming algorithm for a variety of measurement criteria and subject to various restraints on the balance sheet.

The research uses data generated by the long-range planning process at an intermediate sized, multinational corporation listed on the New York Stock Exchange. The data consist of assets, liabilities, and profit and loss statement items for each period in a planning horizon and for each of three alternatives of each SBU in the study. In addition, a beginning corporate balance sheet is required as are planned corporate expense items and the specification of operating restrictions.

Research into the effect of several strategic policies, including dividend rate and debt to equity ratio, on the future prospects of the company in accordance with the optimal value of five different measurement criteria, is reported. The five measurement criteria are present value of shareholder equity, growth in earnings per share, growth in total assets, total assets and growth in sales.

The appendix material contains listings of computer programs used in the model (written in the Basic computer language), the research data

used, numerous computer printouts, and technical discussions on the model.

Several tentative conclusions are listed, many areas for further research are suggested, and strengths and constraints of the model are discussed. It is concluded that the techniques developed have good potential for increasing cash generation and the efficiency of the investment process in a company; the dividend rate has a significant effect on how fast a company can grow; and the model is flexible and can be used for a number of investigative purposes to support company decision-makers.

An interesting area for further research is the tentative conclusion that return on assets, when used as an optimization criterion, produces a significantly different set of SBU alternatives from the one which results from using the other measurement criteria.

PREFACE

This preface presents an overview of the research, the concept of Strategic Business Units (SBU), the methodology employed and the organization of the dissertation.

Research

This dissertation deals with the allocation of resources among profit producing elements, within a business enterprise, to achieve satisfactory results over a planning horizon. There is a great deal of material generally available on the subject, and it is very broad; however, the methods which are developed in the dissertation were chosen for use in a specific business enterprise. In particular, the company is viewed as a confederation of profit-making elements (SBU) which are independent of each other and held together by the power exercised over them by a central authority.

The central authority has a decision-making responsibility and the job of orchestrating the combined efforts of the profit-making elements toward a specified goal. In other words, the management of a company has the responsibility for administering the whole company to achieve a result desired by their "stakeholders". In most multi-divisional companies, as well as many others, this is a complicated task. Certain mechanical techniques can be used, however, to gain insight into the results of

management actions or, alternately, clues can be discovered as to which management actions should be considered, using mechanical aids. The dissertation is an investigation of one such resource allocation approach to aiding management planning and evaluation of the enterprise.

Strategic Business Units (SBU)

In the dissertation the profit-making elements of the company are called SBU, and a typical, large company can be thought of as being composed of 15 to 40 SBU, plus a central decision-making body. During the planning phase of the company's year, several alternative plans (market share options), represented by profit and loss statements and abbreviated balance sheets, are produced for each SBU. The result is a wealth of information composed by planners in each SBU, working in consort with their operating people and central management. Using the planning data and the power of a modern high speed computer to manipulate such specific data, the central decision-making group can greatly enhance their ability to forecast, evaluate, and choose excellent courses of action.

In examining the dissertation, it will become apparent a vast amount of data is involved, but it should also be noted in a company using long-range planning, this data is generated by that process and need only be organized to be used in the procedures discussed.

The problem of this dissertation is difficult enough because of the many combinations of alternatives to be investigated, but it is inherently more difficult because SBU must be considered as whole entities. In

other words, a planner/decision-maker cannot choose to use only a fraction of an SBU in his desired company makeup. However, the work presented here provides a method for how excellent combinations of alternatives can be chosen in spite of the integer nature of the problem.

Methodology

It also should be noted the methods used are designed for investigation using a computer terminal so results are immediately available to the planning analyst and decision-makers. A computer simulation model was developed using a corporate balance sheet as the key scorekeeping device, and the model was structured so as to either select a quasi-optimal set of SBU or simply to evaluate the prospects of an operator selected set. The selection of the near-optimum (quasi-optimum) set of SBU is an integer programming problem, and an algorithm for the solution of this problem was devised as part of the interactive model.

The simulation is of the deterministic (evaluation) type, as compared to the probabilistic type, and as such each run is the complete evaluation of one set of SBU options, unless the model is being used in the optimal mode. If it is, several iterations may be required before a satisfactory set of options is found.

Six strategic policies were evaluated using the model which were:

- 1) the dividend policy, 2) the debt to equity ratio policy, 3) the policy on pricing to obtain market share, 4) the effect of a growth, stability, or liquidation policy, 5) the policy of limiting SBU assets, and 6) a policy

of acquiring SBU with specific characteristics. These policies were investigated relative to the present value of the shareholder equity as a measurement criterion.

Five measurement criteria were used for evaluation, they were:

- 1) the present value of shareholder equity, 2) growth in earnings per share,
- 3) growth in total assets, 4) total assets, and 5) growth in sales.

The research was performed by running the model, with a number of assumed values, and analyzing the results by comparing how the several measures reacted. Although much of the analysis was done by analyzing the independent effects of the policies, the joint effect of the dividend policy and the debt to equity policy was investigated by "mapping" the measurement criteria over a suitable region of interest.

The simulation is restricted by a number of criteria some of which could also be used to carry out investigations into the effects of policies. Some of these are 1) the discount factor used to state future dollar amounts in present values, 2) the minimum acceptable ratio between current assets and current liabilities, 3) the minimum amount of cash as a fraction of other assets, 4) the interest rate on borrowed money, 5) forecasted return on surplus cash which is invested, 6) the maximum acceptable dilution from equity sales and 7) the price at which new equity can be raised.

It was the initial intent of the research to explore the effects which occur when a probability distribution is associated with the contribution of each SBU market share option as well as with the market share each

option achieved. However, as the work progressed it became apparent the computer program for the non-probability case would reach the maximum acceptable size for the computer, and the time to execute an evaluation of a given set of SBU was at least five minutes of "terminal-connect" time. Thus it was determined to carry out a reduced effort in the probability case, but one which would provide a base for further research. To do this, probability distributions were associated with SBU assets, liabilities and profits and the model was used to generate probable outcomes of cash flow and profit for a given set of SBU.

Organization

The examination of this research effort is contained in five chapters and four appendices. Chapter I discusses some aspects of business strategy related to the allocation of resources to large segments of a corporation and mentions some of the concepts for measuring success. Chapter II discusses the research approach in detail, including the simulation model, and the five different optimization criteria, and the policy questions which were investigated.

Chapter III discusses validation of the model and the specific data used in the investigation. As pointed out earlier, the model is of the evaluation type and as a result it has been easier to validate, but to do this both test data and real data were used. Sensitivity of the model to input errors and initial conditions is also mentioned.

Chapter IV discusses the results using the model and contains a number of tables which compare various output results. Chapter V contains the summary and conclusions of the research along with the advantages and disadvantages of the model. A section on suppositions, which contains a number of indicative results which need further investigation, is also included in Chapter V as is a subsection on other investigations which could prove to be interesting and of value.

Appendix A contains the detail techniques for capturing the input data, the application of restrictions, and the computer techniques for finding the quasi-optimal solution to the integer programming problem. Appendix B contains a listing of the principal computer programs used in the research.

Appendix C is a collection of specific run results along with information on interpreting the computer printouts. Appendix D is a collection of the data which was used as input to the research.

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Donald L. Pope

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CHAPTER I

BUSINESS STRATEGY

I. OVERVIEW

This chapter discusses the general nature of business strategy as a base for developing the specific research problems of the dissertation. The principal problem under investigation has to do with the allocation of company resources to large operating segments of the company in such a way as to satisfactorily achieve company objectives. The concept of Strategic Business Units (SBU) is introduced as a structure and as the set of decision variables to be used for the allocation of resources.

Concepts for measuring success are discussed, and the particular importance of generating sufficient cash is examined as is the role cash generation plays in limiting the growth rate of a business. The concept of managing the set of SBU which constitute a company, as an investment portfolio, is discussed.

II. THE PROBLEM

The principal problem is the allocation of company resources (cash) to large operating segments of the company in such a way as to satis-

factorily achieve company objectives. This dissertation is also concerned with a discussion of some of the strategic problems facing the firm, some of the measurements of success, some techniques for choosing strategies, an examination of the concept of Strategic Business Units (SBU) introduced by the Boston Consulting Group (BCG) (5), and some techniques for managing by SBU. The research deals to a large extent with systematic techniques for selecting those SBU which meet selected criteria and a discussion of the implications of doing so. Thus, this work deals with an area of strategic business planning and brings some of the techniques and tools of system analysis including a computerized simulation model to bear on the problems.

The typical firm must manage many resources and is faced with the generation and investment of large amounts of cash each year. Because the techniques explored in this paper have the potential for significantly increasing the effectiveness of the cash generation and investment process, it is believed to be of substantial value.

III. STRATEGY

The large business corporation today is a complex system of interconnected parts which is managed to achieve a complex set of inter-related goals. The management discipline frequently described for handling the long range portion of this task is variously named Long Range Planning, Strategic Planning, Corporate Planning, Top Management Plan-

ning, Corporate Strategy, and Business Strategy (1, 2, 5, 7, 15, 37). Authors writing under these titles cover many of the same subjects, and the name ascribed to the process seems to be more one of personal taste than close definition.

During the late 1950's and early 1960's, comprehensive (or long-range planning) expanded rapidly (15). This rapid expansion seems to have been in response to the recognition that strategic planning can provide a very important advantage to the company that employs it successfully. Steiner (15) states:

One of the great advantages of such planning is that it simulates the future - on paper. If the simulation does not result in the desired picture, the exercise can be erased and started all over again --- planning prepares a business to cope better with the environmental changes of the future.

Cannon (7) points out that, "Business strategies are not the ends, but rather the means of initiating the actions needed to achieve the ends or purposes of the company". For these reasons it is important to understand how the various strategies and resulting plans employed by a company affect its long-run prospects.

Many of the problems facing a corporation are not strategic in nature, and a good definition of what is strategic and what is non-strategic (or tactical, or operational) is required. Steiner makes a good case that plans should be integrated with operations and plans are more effective when this is done (15, pp 132-136). On a continuum strategic planning is at one end and tactics or operations are at the other. Steiner gives

fifteen characteristics for differentiating between strategies and tactical planning showing the complexity of the subject. (15, pp 37-38). In a simplistic sense, tactical planning is the detailed deployment of resources to achieve the strategic plans. Ackoff states "The more functions of an organization's activities that are affected by a plan, the more strategic it is". (1)

Strategic Problems Facing a Large Corporation

The modern business corporation, where the techniques discussed in this paper will be of most value, is complex in the sense of dealing in many products and frequently across many national borders. Most, if not all, will be classified as multinational, although being multinational is not in itself a requirement for using these techniques. Rather it is complexity, and most particularly, complexity in the number and outcomes of investment opportunities, facing the corporate decision-makers, which is important. The typical large company is composed of many organizational units reporting through structure to a corporate headquarters. Some employ centralized management and some decentralized management, but in all, the key allocation decisions are made at the top and frequently require approval by the board of directors.

A key allocation decision is taken to mean such things as the acquisition of another company, the development of goals and objectives of significant operating units of the company, and development of policies relating to such things as spending for research and development,

new products, advertising, plant and equipment, inventory levels, etc. They are allocation decisions because all imply something about the use of resources, usually cash, and they are key because they frequently have a large bearing on the outcome of the company. The discussion focuses mainly on the allocation of cash. The management of other resources are important, but in long-range planning, many can be liquidated into cash or acquired by the expenditures of cash.

There are a host of restrictions on the corporation some of which are well-defined, and some of which are "fuzzy" in the sense of not being formally defined or are subject to interpretation, as the case arises. Among these restrictions are external forces such as national laws, taxes and policies; physical factors of the business environment such as transportation, weather, and labor availability and quality; and those imposed on or by the corporation balance sheet. The balance sheet is a subject of particular interest in this paper. Some of the constraints on the balance sheet are the ratio of debt to equity, of short-term assets to short-term liabilities, of cash to short-term assets, of short-term to long term debt, and ultimately the amount of new equity (if any) the enterprise can obtain.

Some of the variables which serve to complicate the planning process either implicitly or explicitly are the dividend policy of the company, the profit from operations of the company, the action of competitors, the cash generation to be expected, the cash consumption expected, cost and

availability of borrowed capital, and the return on invested funds. All of these factors must be considered and decisions rendered on the allocation of present and future cash to competing components of a company. How to do this is surely one of the most important questions facing the strategic decision-making body of the corporation.

Corporate Planning

As corporate planning grew, more factors were recognized and many articles were written on the subject, and some successes and many failures were noted (15). Many schemes of organization and techniques for planning were tried, modified, and tried again, and the field has been in a state of rapid evolution from the time of its recognized beginning (15). Of course, in some sense strategic planning is as old as business itself, but the modern era started with the advent of the large scale digital computer which allowed planners to build simplified models of the firm and evaluate future results of current policy actions.

There has been a large element of qualitative thinking in most good strategic plans, and in some sense, thinking through the problem and putting the thoughts on paper may be a major value of strategic planning. However, introduction of quantitative methods has made it possible to judge the feasibility of a set of strategies. As an example, the results of the disastrous reduction in security values in 1969-1974 could have been modeled and evaluated for those companies which employed a heavy debt strategy to determine what effect the reduction in security prices

would have had on their ability to maintain their strategy.

There are a number of strengths associated with planning versus non planning, but perhaps the most apparent is the value received from formalizing thoughts about the future. Another is composing alternative strategies, a third is depicting likely future scenarios, and a fourth is building a normative future. Weaknesses or shortcomings in planning seem to include 1) the amount of work required, 2) scenarios built on inaccurate information, 3) bad organization, and 4) failure to take into account the right variables (3, 15).

There are a number of problems facing the planner/decision-maker, but those dealt with in this paper are selecting a management entity, selecting variables for measuring success of the total corporation, selecting which entities should be included in the corporation, which should be liquidated (or not purchased), and of those included, what should be expected of them with regard to their key variables. It appears some of the key decisions for corporate management are 1) into which management entity should capital be invested, 2) how much growth should be encouraged, 3) how much cash should be produced or consumed, and 4) which entities should be liquidated and 5) which should be acquired.

The Concept of Strategic Business Units

A concept introduced by the Boston Consulting Group (BCG) is particularly interesting, and although there does not seem to be much written about it they have applied it to a considerable degree in their consulting

work (5, 6). The BCG is an international management consulting organization specializing in policy issues related to Corporate strategy development and has written numerous working papers and a number of pamphlets and books which deal with various aspects of Corporate strategy (5, 34, 35, 36, 37, 38). In addition, they have worked closely with companies, and the techniques they develop for a specific company may not be made public and hence may not be widely used. The BCG has brought a certain amount of consistency and order to the investment decisions mentioned above by formulating the problem in terms of the management of a portfolio of SBU. Ansoff (2) suggests a similar concept in terms of a portfolio of markets, but BCG assumes the units are independent businesses from the point of view of strategic decisions; whereas Ansoff uses the concept in connection with desirable markets to enter. The SBU is very important to the concepts developed further in this paper and should be carefully considered before proceeding.

Many major companies can be characterized as composed of a number of relatively independent sub organizations and are structured around familiar ways of organizing such as job function, product line, and profit centers. In a private communication BCG has indicated that an SBU may be thought of as a business which can be managed in a strategic sense, reasonably independently of the rest of the company, so that a decision could be made to either expand the business rapidly to a position of competitive dominance or to sell it off entirely without worrying about

the effect of that decision on the other businesses in the company. An SBU is the smallest component which allows this range of decision, and thus a company may be thought of as a set of SBU which are independent, operational entities to be managed in such a way as to optimize company objectives in the long run and hence as a portfolio of investments to be managed.

The SBU is a new way of structuring thinking about the management task, and like other approaches it has strengths and weaknesses. Its main weakness is in the assumption that one business unit is independent of all other business units in the company. This is only approximately true for most entities; however, the degree to which it is true enters into the decision whether to formulate an entity as an SBU or to combine it with entities with which it is interdependent to formulate a larger SBU. The strength of the SBU concept is similar to, but greater than, those associated with product line management concepts. It is more powerful than management by product line; however, because once a business unit is defined, the usual financial and accounting data can be maintained, and business units can be described and measured in terms of profitability, growth rate, market share, growth in industry, competitors' size, cash generation, assets employed, capital retention percentage, and so on. Of course, many of these same measures can be developed for other management structures; but seemingly with more difficulty and inaccuracy than with SBU.

The Criteria for Defining an SBU

The criteria for defining an SBU seem to be those given in Figure 1.

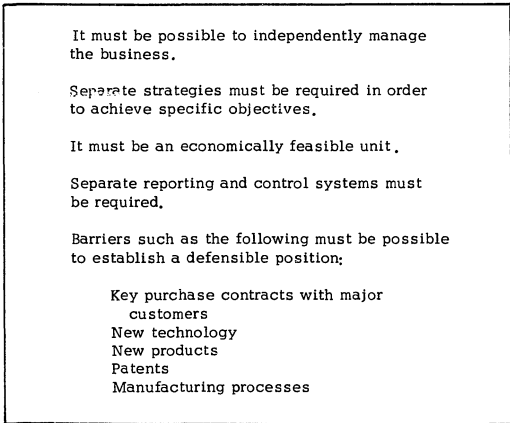


Figure 1. Criteria for defining an SBU as a separate entity.

There is very little written on the use of SBU, but the BCG has stated privately a number of their clients have used the SBU concept. Probably the most important of the criteria for defining an SBU is the requirement the SBU can be managed independently, which means the results of taking a range of management actions in one SBU have a negligible effect on all other SBU. The obvious problem with the independence assumption comes when products or markets of one SBU are affected by actions taken in another. If the effect is material, it seems the two affected parts should be combined, or if they cannot be without changing

parts of the original, perhaps they should be combined in total. It is also possible the SBU concept does not fit every situation.

A less obvious problem with the independence assumption, but one which is probably more important, occurs when allocations of shared assets are altered by acquisition or divestiture. Perhaps this problem is handled best by carefully attributing the full share of allocated expenses to each SBU. In the case an SBU is managed for its "marginal" contribution to the corporation (because it uses otherwise under-employed assets), management must recognize it may not be profitable on a "stand alone" basis and be willing to establish reduced profit objectives.

Another of the criteria which seems to be particularly important is the SBU must be large enough to be an economical unit. This means, although the size will vary with each company situation, that the extra cost of applying management to the unit is economically justified. If an SBU is too small, the information gathering, controlling, reporting, planning, and other management functions may cost more than can be gained through any better management decisions which might result. Also, too many SBU in a corporation may produce too high a level of complication. What constitutes too high a level complication depends on the particular company, its organization structure, expertise, informing-handling capacity, management training, markets and products among others.

Another criterion requires a "defensible barrier" be erected around the SBU. Thus geography, technology, transportation costs, patents,

contracts, tariffs, new technology, and secret processes help serve this purpose.

Some of the Difficulties in using SBU

Most companies probably have not had a long history of being managed by SBU and thus are likely to be presently managed in units which when examined are mixtures of SBU. As examples, it is likely a large plant would be found to produce products for several SBU, sales managers may be selling the products of several SBU, and similarly for other company functions. This is not necessarily bad, and the degree to which assets and people should be physically separated is dictated by the economies involved. However, those resources which are not physically assigned to one SBU or another must be allocated on some rational basis. There are some expenses, and perhaps some assets, which are strictly corporate in nature and need not be allocated to any SBU, but if relatively small it is not likely the allocation of such corporate items materially changes the quantitative aspects of the management decision process; although it is possible it affects the "psychological" aspects of the managerial process.

Thus far it seems a number of the problems and difficulties of managing by SBU have been raised, and it is appropriate to mention some of the advantages of using the SBU concept. On the positive side, there seems to be one major advantage which is that much of the theory, built over the years for managing investments and for making micro-economic decisions

in a firm, is available for making decisions about SBU. Thus, a company can be thought of as a portfolio of independent investments, some of which are owned and some of which are only potentially members, and the principal problem is to find the best (or, at least, a satisfactory) set of possible SBU to comprise the company portfolio, given the projected operating results and characteristics data of each.

Most companies generate and invest millions of dollars each year, and it seems a systematic approach to such investment problems could produce a significant economic advantage to a company which utilizes them. It is hypothesized a more systematic and rigorous approach, to the investment problem using the concept of SBU in conjunction with appropriate factors for measuring success over the planning horizon, will provide techniques for significantly increasing the effectiveness of the cash generation and cash investment process.

IV. CONCEPTS FOR MEASURING SUCCESS

There are a number of methods, and combination of methods, available for measuring and predicting success of part of a company and a company as a whole. There are a number of "older" quantitative measures (15) which are used by the top management of an enterprise to determine its present, and the likelihood of its continuing success. Traditional accounting and balance sheet data such as after tax earnings per share, dividend rates, number of continuous periods for which dividends have

been paid, growth in earnings per share and growth in sales are examples of such measures (15). Another older method is to consider the number of years required to "pay back" the cost of the initial investment of a specific project and to accept the project if the number of years is less than the established criteria of the company (6). These older methods are currently in wide use, and although they may be faulted for measuring the wrong factors, or not considering all factors, they are in use and "understood" by people who are currently top decision-makers in industry.

Among "newer" techniques, currently employed for evaluating alternative investments for cash, is Return on Investment (ROI) which is a simple calculation of a ratio of income to investment cost (15). It is similar in use to Discounted Cash Flow (DCF), where the present value of the cash flow of a project is compared to a cutting score established by management. If the ratio is equal to or greater than the cutting score, the project is accepted (15, 21). Although these methods and the method of pay back period mentioned above are frequently applied to smaller units than the SBU, they can be applied to much larger units as well. On large scale decisions such measures as profit growth, replacement of depreciation and the set of all projects justified by ROI have been used (34). These methods, as well as the "older" methods, suffer from frequently being uncoordinated, and their affect on overall company success is not well understood.

The BCG has suggested that from the point of view of a shareholder in

a company, for an investment to be of value, it must pay dividends to the investor at some point (34). This implies that the appreciation in stock price, which seems to be attractive to many investors, is promulgated on the expectation that at some time (however far into the future) the company will return cash to the owner of company stock. This does not mean a company must pay dividends in the short range or that a dividend-paying company is a good one. In fact, it is quite possible dividends are a poor strategy (36). Rather, it means there must be a reasonable expectation the company could pay dividends (or that the realistic liquidation value of the company is significant). If accepted accounting principles are used, the ability to pay dividends is measured in part by size of shareholder equity.

If a company wishes to grow it must generate sufficient cash to invest in enough profitable opportunities to meet its growth objective. If a company cannot find better opportunities than bank interest rates (to pay off loans or to keep it from borrowing money), perhaps it should pass the money on to shareholders for they probably can do as well. The point of this statement is that a company's earnings per share may not be an adequate measure of success, and the increase in shareholder equity per share may be a better measure for the purpose of the shareholder. It may be the decision-maker should examine several measures before making an investment decision.

The Generation of Cash

Another important variable and measurement factor is the amount of cash generated. Cash is generated and consumed in a number of ways in a company (See Figure 2 and 3).

Figure 2 shows the relation of cash flows between the corporate decision node and the SBU, while Figure 3 shows the cash flows within an SBU. The charts are simplified and do not show the time delays which need to be considered to make them realistic.

If a significant amount of cash is generated, beyond cash consumption needs, so that a positive cash flow results, the company is in a position to reinvest this cash or to declare it as dividends to its shareholders. Thus the amount of positive cash flow is an important measurement criterion of company success. It is then incumbent upon management to put this cash to the best possible use, and one measure of management success is how well they invest this cash.

This point also has a subtler implication as well, which is that if a company does not have a positive cash flow, and further if it has no real prospect of a positive cash flow, then no matter how profitable it may be, it will eventually reach a point where it can no longer borrow money, equity will be diluted, and it will never be able to pay a dividend. It then appears the company's stock price will suffer, and it will be judged to have been a poor investment for the shareholders involved. This factor is embodied in the present value of the shareholder equity, and

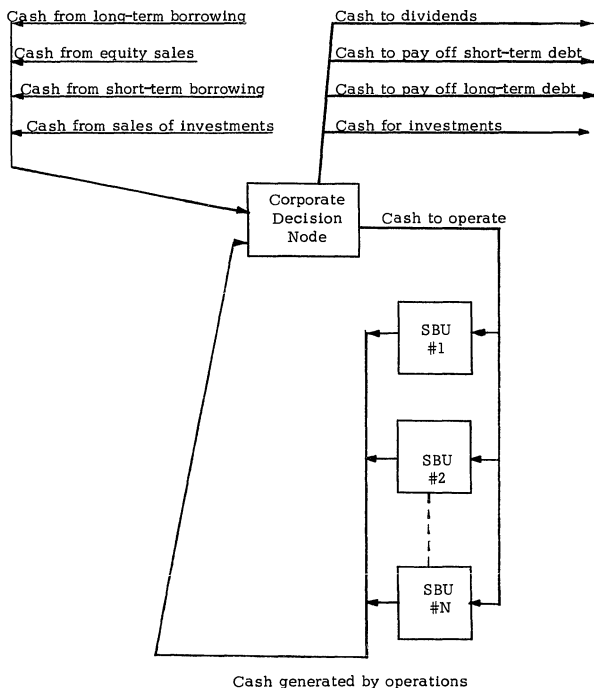


Figure 2. The relation of cash flows between corporate and the strategic business units.

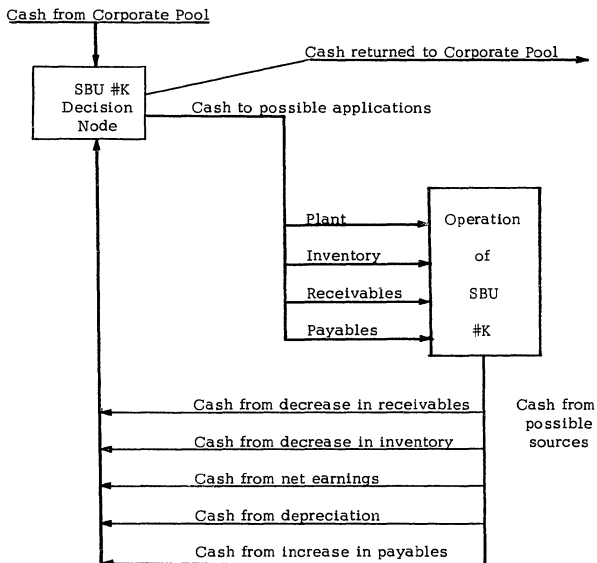


Figure 3. The cash flows within a strategic business unit.

hence the present value of shareholder equity is proposed as a good measure of corporate success.

There are other pertinent measurement factors at work in a corporation. It is not uncommon for each operating manager of each unit to be judged on performance on a year-to-year basis and to have a significant amount of his pay depend on the annual results obtained rather than the results obtained over his career (6). This influences him to produce as much profit growth as possible in the short run, and such a strategy seems to leave to chance how well the long-run objectives of the company are met. As will be discussed later, there is a relationship between growth of an SBU and the amount of cash consumed or generated (38). The current methods for selecting which element of a company should generate cash, and which should be managed for growth by investment of cash, seems to be judgmental. Further, because of the short-term pressure mentioned above, the decision may not be made in a rational, concise manner but may follow by default.

In light of the above discussion, it appears several measures of company success should be utilized to aid strategic decision making and several of these are used in the research reported here. One of the most inclusive is the present value of long-run shareholder equity. Others are growth in earnings per share, total assets, growth in total assets and growth in sales.

The Present Value of Shareholder Equity

Shareholder equity is a standard balance sheet item which is used to measure at one point in time (generally at year end, but conceptually at any time a balance sheet is prepared) the value which will accrue to shareholders if the company is liquidated. Thus, it is the excess of assets over other liabilities. It does not generally reflect the actual value of a corporation's stock on an established market as shares may sell at substantial amounts over this figure at times for some companies, and at less than this value at other times. It is, however, a well-known measure which is available for all publicly held companies, and it seems to be a better measure for long-run purposes than stock price which is subject to the vagaries of a highly unpredictable market place.

In general, shareholder equity is increased by earnings and equity sales and decreased by dividends paid out or losses sustained. There can be other accounting transactions which affect equity for a complicated company, but these are generally relatively small and need not be considered for the purpose of this discussion. If it ever is necessary to consider them, they can be treated as one of the three types of classifications mentioned above without loss of generality. As mentioned in the previous paragraph, a balance sheet records the assets and liabilities at a point in time. All publicly held companies are required by governmental regulations to publish an audited balance sheet at the close of each year.

For the purpose of decision-making, the present value of the shareholder equity is desirable because it puts on a comparable basis the value of alternative futures. The mathematical formula for the present value of the shareholder equity of a set of SBU is discussed in Appendix A.

Growth in Earnings Per Share

Probably the most commonly used measure of success is growth in earnings per share. There seems to be a substantial premium placed on the value of companies, which maintain a steady growth rate in earnings per share, by the investment community. This figure is normally the after tax rate, but the before tax rate can be of interest in special situations where non-uniform tax rates apply. High earnings per share, although desirable, are not as important as a demonstrable growth in earnings per share, and a consistent growth pattern seems to be more desirable yet. By a consistent growth pattern is meant that a regression line for earnings per share versus time will have a positive slope and a "high" coefficient of correlation.

Total Assets and Growth in Total Assets

Two other measures of success are total assets and the growth in total assets of the corporation. Total assets are taken from the balance sheet of the corporation and are customarily thought of as the sum of cash, inventory, receivables, investments, real estate, and buildings and equipment, less depreciation. In addition, many balance sheets contain intangible assets which represent the value of patents, licenses,

trademarks, and corporate goodwill. Total assets are equal to the total liabilities of the corporation, and hence from year to year may be subject to variations not truly reflecting any particular change in the business health. As an example, if payables are increased through a failure to pay bills, cash will be increased and assets will be larger, but the value of the business may not be judged to be higher. Further, if the growth in total assets has been in buildings or intangibles, the true value of the business may not have been increased proportionately. Thus the size of assets or the growth of assets, particularly over a few years, may not be a good measure, but over a longer period of time it is indicative, and if the balance sheet values remain in the same ratio to one another at the end of a study horizon as at the start, either total assets or growth in total assets can be useful measures.

Growth in Sales

Probably the second most watched measure of business success is growth in sales. Sales are also frequently used in the denominator of ratios which express such things as profit, margin, and expenses as a fraction of sales so they may be compared from period to period. As an example, Fortune magazine (39) ranks the 500 largest manufacturing companies in the United States in terms of dollars of sales, but to maintain its rank on the list, a company must grow as fast in sales as its nearest competitors in rank and to gain higher rank must grow faster in sales. There seems to be a certain degree of status attached to being ranked in

this select group and hence, at least in some quarters, growth in sales is watched as an important measure of business success.

Other Measures of Success

There are a number of other measures of success which could be mentioned, but because they are not emphasized in the research reported in this work, they will not be discussed; however, one of particular importance which will be mentioned is return on assets employed. For large-scale evaluation, this factor can be taken as the ratio of after tax profit to total assets. Alternately, a sub set of assets may be chosen, such as plant and equipment, inventory and receivables, or plant and equipment before or after depreciation. In any case, consistency in the manner in which the measure is applied in comparison among entities is probably more important than any one choice of the denominator in the measure.

V. MANAGING A PORTFOLIO OF STRATEGIC BUSINESS UNITS

This work is most certainly not intended to be a discussion of management generally, but two points, which may be peculiar to managing or thinking about a company in the context of SBU need to be mentioned. These are used in other systems also, but they are emphasized as being of particular importance here, because the system using SBU focuses on them. One of these is how much cash is available for reinvestment and the other, closely related to the first, is how fast the portfolio can grow

in terms of earnings (or other acceptable measures).

Relationship between Growth and Cash

Cash flow and how it is calculated has been discussed, but the relationship between growth and cash generation is very important and is given by BCG (36) in the following form. First, growth rate is used by BCG to be the firm's return on equity if no dividends are paid and is given by them as:

$$\text{Growth rate} = \left(\frac{D}{E} (r - i) + r \right)$$

D = debt

E = equity

r = rate of return on total assets before
interest on debt

i = rate of interest paid on debt

"Since dividend payments reduce this rate of growth in assets, the effect of dividends may be introduced by multiplying the expression by (p) , the percent of earnings retained." (36; Page 10)

$$\text{Then, } p \text{ multiplied by growth rate} = p \left(\frac{D}{E} (r - i) + r \right) = g$$

If the effect after tax is to be considered each side of the equation must be multiplied by (t) , as one minus the effective tax rate, to give the fraction of earnings retained after tax; thus,

$$tg = pt \left(\frac{D}{E} (r - i) + r \right)$$

Cash enters the formulation through the debt coefficient, and if there is a positive cash flow during a given period, debt may be reduced as seen

by examining balance sheet arithmetic. Because if excess cash is available, a given amount may be subtracted from both the cash and debt account, leaving the balance sheet with total assets equal to total liabilities. On the other hand, if cash is consumed by the company (and other accounts remain equal), debt must be increased. In both instances, equity could have been changed, had the decision-maker so desired, by buying the company's shares. The equity section of the balance sheet would thus be reduced, by selling shares to raise further cash and increasing the size of the equity section. It should also be noted that expansion in the business enterprise generally requires an investment in cash because increased sales frequently mean increased receivables, inventories and/or production facilities.

In the above equation, growth is a function of debt and equity, which in turn is a function of the amount of cash generated, but the ratio of debt to equity is limited by management's willingness to accept risk. A maximum figure for the debt to equity ratio seems to be about (0.60), as found in (9). Thus, for whatever level of debt to equity chosen, the growth rate of the corporation is limited by the amount of cash it generates. Other factors enter the formula, particularly profit and the cost control mechanisms, which can be employed to increase profit, but after cost control steps are taken and everything has been done with price to maximize return, growth is still seen to be limited by the amount of cash generated.

Other Factors which influence Growth

Other factors which influence growth rate are dividends and taxes, and it is fairly obvious reduced taxes are desirable. Tax reductions are possible through certain types of tax havens, and other considerations available to multinational corporations (40), and should be taken into account in strategic decision-making. On the other hand, dividends enter the growth formula in exactly the same way as taxes, but are presumed to have a positive effect on the value at which new equity can be raised. There is substantial literature on the advisability and reason for paying dividends (9) which need not be discussed here, but it is one of the strategic decisions which must be rendered, and because the dividend rate has a material effect on the rate at which a company can grow, it should be carefully considered.

Another reason why the portfolio of SBU is an important concept in strategy is because each member of the set of SBU can be examined not only in light of usual management criteria, but for what it can contribute in terms of cash (or the consumption of cash) so as to balance the cash needs of the corporation with its growth objectives. Further, growth objectives over time can be examined in light of the potentials of the portfolio, and strategic actions can be taken to acquire or liquidate holdings to balance cash-generating and consuming units to meet corporate growth objectives.

VI. SUMMARY

This chapter has discussed the problem undertaken in the dissertation, along with the nature of business strategy. The concept of the Strategic Business Unit (SBU) was introduced, as were several measures of success. The importance of cash generation was mentioned, and how cash generation limits the growth rate of a business was explored. The concept of a portfolio of business units was introduced, and it was mentioned that one purpose of this research was to develop and test a methodology for improving on the current methods of selecting those SBU which should be included in a company portfolio.

In the next chapter the structure of the simulation model and the details of the research are explored in depth. The specific technique, for evaluating and selecting optimal sets of SBU according to certain optimization criteria, is discussed. The research program covers such topics as the dividend policy, the debt to equity ratio policy, the policy on pricing to obtain market share, and the effect of managing an SBU for growth, stability, or liquidation. Also examined in the research program is the effect of limiting SBU assets, the effect of acquiring SBU with specific characteristics, joint effects of some strategic policies, the difficulty of working with probabilistic assumptions, and the research technique used to obtain some probabilistic results.

CHAPTER II

THE RESEARCH

I. OVERVIEW

This chapter discusses the objectives of the research, the nature of the simulation model used and the research program undertaken. The optimization routines are discussed here and found in more detail in Appendix A for each of the five measures of success explored. In a like manner, the necessary but complicated detail associated with the input to the model is found in Appendix A, although the essentials are discussed in this chapter. The restrictions on the model are very important in testing actual situations, and these are explored, along with ways they might be altered to give insight into a problem being researched.

Research is called for on six different policies, and at first each of these is examined independently of the others while later the joint effect between two of the more important ones is investigated. The number of computer runs to carry out the indicated research is shown to be substantial. Finally, the difficulty in carrying through the research under probabilistic assumptions is discussed, as is the specific research for the probabilistic work which was accomplished.

II. OBJECTIVE OF THE RESEARCH

One objective of the research was to develop and test a methodology for selecting those SBU which should be included in a company portfolio and to determine the investment strategy which should be used with each. In doing this, a simulation model of a company composed of a number of SBU was designed, and a decision procedure for selecting a "best" set of SBU was included as an integral part of the simulation model.

Another objective of the research was to use the simulation model to test various strategies applicable to the management of a portfolio of SBU. The simulation model was used to investigate the effect of 1) the dividend policy, and 2) the debt to equity ratio policy, on the five measures of success mentioned in Chapter I. Other policies investigated include 1) the policy on pricing to obtain market share; 2) the effect of managing SBU for growth, stability, or liquidation of market share; 3) the effect of limiting SBU assets; and 4) the effect on the overall results of the corporation of acquiring SBU with specific characteristics.

Chapter I described the concept of SBU and the various measurement factors which can be applied to them for determining success. Once this is done, it seems likely some SBU will present a better investment opportunity for the corporation than will others, and if resources are severely limited, it may be necessary to liquidate some SBU or not invest in all of the acquisition prospects presented. Thus the set of SBU to be considered may not all be a part of the corporation, but some can be included as prospective acquisition candidates; Of course, their liquid-

ation will not generate cash to the corporation, but it is seen as a signal not to buy.

III. THE SIMULATION MODEL

The simulation model is composed of an output section, an input section and a calculation section. This portion of the chapter describes with frequent reference to Appendix A, the calculation section, the input to the simulation, the restrictions on the model, the output of the simulation, the optimization routine, and the computer used to operate the model. The corporation balance sheet is used as the score-keeping device of the simulation, and because it is an evaluation class of simulation the results are deterministic. In other words, the model does not use the technique of making a number of runs with data drawn from probability distribution to obtain a distribution of results. Except for some limited probabilistic investigations, the model uses the input data as completely deterministic and calculates the resulting output using fixed arithmetical relationships.

From the point of view of building, design and operation of the model, the input and output are most time-consuming, but do not present any particularly difficult concepts. They are, of course, necessary to understand, and the coding and systemization techniques are particularly important to the simulation efficiency.

The Calculation Section of the Model

It is the calculation section of the model which is particularly important and some of the techniques used there are not conceptually obvious. Figures 4 and 5 are the flow charts of the overall simulation model. Because of limitations of the computer (or the size of the simulation program), it was necessary to partition the simulation model into three sections. Sections I and II of the model are depicted in Figures 4 and 5 respectively, but Section III is not shown in flow chart form because it only manipulates data, prints output results, and is so conceptually simple that it need not be displayed. The computer programs referenced in the figures are found in Appendix B.

There are two modes of operation considered in the simulation. The first is the evaluation of a set of SBU as given without the possibility of selecting an "improved" subset. The second mode is that which selects an "improved" subset subject to given restrictions and evaluates the results, as in the first mode. There are references made to several factors and operations in the flow charts relative to the optimization mode which are not obvious, and these are discussed in the optimization portion of Appendix A.

The Corporation Balance Sheet

The simplified corporation balance sheet shown in Figure 6 is the basic device for keeping score in the simulation, and because it is also

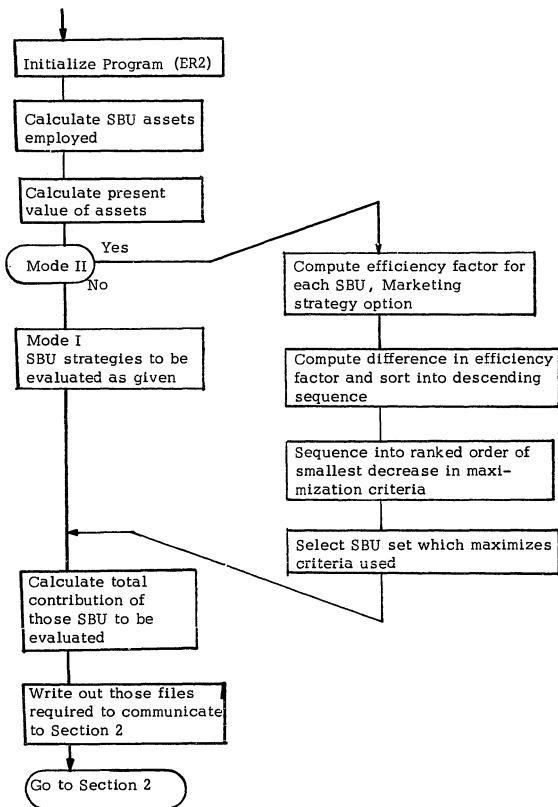


Figure 4.

Section I of model

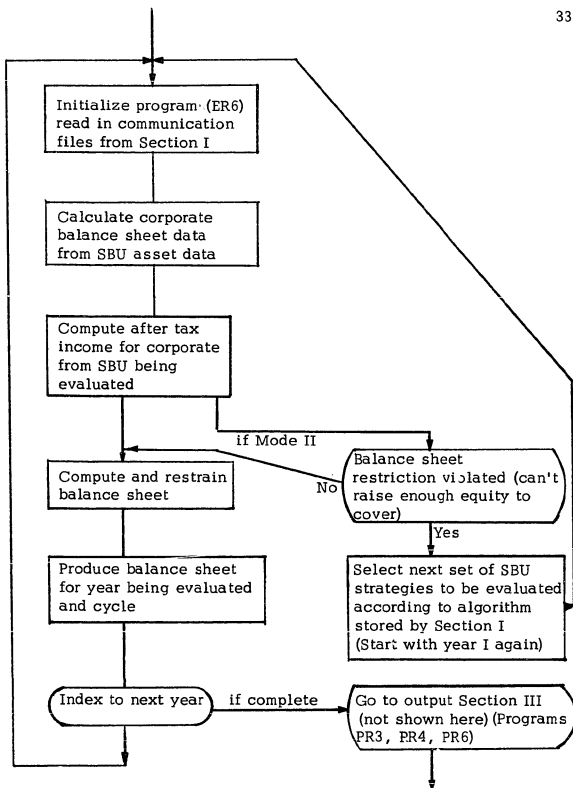


Figure 5.

Section II of model

the device for recording the state of the corporation at a given time, it is the principal object of the simulation. Its role is described in more detail in Appendix A, but using the balance sheet, the simulation proceeds from year to year, starting with the beginning year data, and cycles through the data one year at a time until it has completed a new balance sheet for each year. The restrictions on the balance sheet, along with the input data, determine the beginning balance sheet for the next year's cycle. If the balance sheet restrictions are violated, the simulation is started again with less aggressive market share strategies and the process is repeated until an acceptable balance sheet is computed for all years.

<u>Assets</u>		<u>Liabilities</u>	
Cash	XXX	Payables	XXX
Inventories	XXX	Short Term Debt	XXX
Receivables	XXX		
Total Current Assets	XXXX	Total Current Liab.	XXXX
Plant	XXX	Long Term Debt	XXX
Depreciation	(XXX)	Shareholder Equity	XXX
Sub Total	XXX		
Investments	XXX		
Total Assets	XXXX	Total Liabilities	XXXX

Figure 6. Simplified corporation balance sheet.

Input to the Simulation

The input to the simulation, along with the computer programs which perform the calculations, is a very important portion of the process, and thus it is particularly desirable to understand the data required to specify a major corporation. The data input sheets, as displayed and discussed in Appendix A, depict the information required. But because an explanation of the input requirements is involved, it is also found in Appendix A. It is necessary to go through the discussion there, if a detailed understanding of the simulation process of the corporation is to be obtained.

The SBU profit and loss statement and the SBU assets and liabilities must be pre-calculated for each market share option of each SBU for each year in the planning horizon. Because a medium to large company can easily have 20 SBU, three market share options per SBU, and a planning horizon of five years, this set of data can be 300 pages in length and contain 4,500 separate entries. This gives the reader some appreciation of the size of the task facing the would-be model user, and it would be very difficult to collect and organize this mass of data for the research, had it not been calculated as part of the long-range planning process of the company being modeled.

Appendix A should be consulted in any case to get an overview of the forms used and nature of the data required. In particular, the sub section on corporate operating criteria should be examined to understand specific assumptions and restrictions called out for input, and although these data

are for input, it is through changes in them that the effect of policy changes in such things as debt to equity ratio and dividend rate are entered into the simulation model.

Restrictions

The restrictions which are used as described below are part of the computer programs found in Appendix B, and are described in some detail in Appendix A. Only one market share assumption for each SBU is to be used in the totals reaching the balance sheet, and the model is constrained so not more than one market share option for an SBU will be in the final set chosen. The market share options are not designed to be changed during the course of a simulation run, although it is assumed an SBU can be liquidated if necessary during the planning horizon. If it appears a mixed strategy of market share options is desirable, the system as depicted is sufficiently general to accomplish this if the user will formulate such a combination of input data.

There are many other restrictions, some of which are implicit in the assumptions of the computer program and others which are explicit in the computer input mentioned in the previous sub section. The most important ones are debt to equity ratio, the value at which new equity can be raised, the maximum dilutions from equity sales which will be allowed, the minimum ratio of short term assets to short term liabilities (current ratio), and the minimum amount of cash which must be maintained as a fraction of other beginning current assets.

The Output of the Simulation

The output and results of the simulation are discussed in more detail in Chapter IV. In general, there are two classes of output; one aids the researcher in determining if the simulation is functioning as designed, and a second helps the researcher (or manager) explore the effects of various possible strategic actions. Only the second class is discussed in this chapter, the other deemed a part of computer programming and model validation, and is discussed in Chapter III.

The output is used for gaining insight for strategic decision-making and is generalized as follows, but the specific cases used and the research results obtained are found in Chapter IV. The output is: 1) The SBU and the related market share strategies selected in each study (as mentioned previously, these are either specified by the operator or alternately are selected by a quasi-optimization routine); 2) the resulting balance sheet and income statement for each year; 3) the present value of shareholder equity; 4) earnings per share by year; 5) growth in earnings per share per year; 6) growth in total assets; 7) total assets; 8) growth in sales; 9) return on shareholder equity by year; 10) return on assets employed by year; 11) debt to equity ratio by year; 12) required borrowings and/or equity sales by year; and 13) net cash generated each year.

The Optimization Routine

As mentioned previously, the simulation is carried out in one of two

ways -- either as an evaluation of a given set of SBU market share options, or if so desired, by the operator, the model will select the best set of SBU market share options which satisfy the restraints mentioned above. Best is defined in terms of one of the five measurement criteria used in the research. They are treated as being totally independent, with no attempt made to obtain a global optimum because of both the complexity of the task, and the questionable value which could come from such an attempt when the surface is not smooth and the input data, being management estimates and frequently subject to error.

The five criteria used subject to the restrictions on the balance sheet were: 1) the present value of long run shareholder equity; 2) the growth in earnings per share; 3) growth in total assets; 4) total assets; and 5) growth in sales. The optimization algorithm for each measurement factor is described in Appendix A; the measurement criteria and the derivation of the technique to solve the integer programming problem involved should be noted in particular. If it happens a restricted optimum must be obtained, the routine requires an interactive input from the operator.

The Computer

The computer used in the research was an IBM 370 Model 135. The computer program was operated in a time share mode using IBM's ITF time share package (10) with 65,000 Bytes of Core storage. The programs were written in the IBM subset of the Basic language and are described in

Appendix B. They were operated from a teletype TT33 with a punched paper tape input device, but other such terminals could have been used equally well. Other time-sharing services are available which provide much larger memories and more efficient software, and if they had been used, they would have made the computer programming simpler, because there would not have been as many small programs required, and disk files to store the input data could have been avoided.

IV. THE RESEARCH PROGRAM

The results of the research program are discussed with much detail in Chapter IV, but the strategic policies to be tested and the techniques used are discussed in what follows. First, these policies were investigated independently from each other, and later the joint effect between the dividend policy and the debt to equity ratio policy was investigated. Probabilistic assumptions are discussed separately in Section V of this chapter.

The Dividend Policy

The fact that paying dividends reduces cash available for growth, as well as the rate at which a company can grow, has already been discussed. This effect was examined by varying the dividend rate by steps of 0.10 and analyzing the change in the five measurement criteria already mentioned. The optimal set of SBU options for each of the measurement criteria, with an assumed dividend rate, was used as a base line and deviations were

measured from it.

The Debt to Equity Ratio Policy

The meaning of this ratio has been presented in Chapter I. The maximum allowable debt to equity ratio was changed in incremental steps and the resulting changes in the measurement criteria of the five cases were analyzed. The optimal set of SBU market share options was found for a specific assumption of the ratio and deviations were measured from it by using that set as the control set.

The Policy on Pricing to Obtain Market Share

The policy was examined by pre-selecting those SBU market share options which resulted in maximum market share and evaluating this set as a base line. The effect then was compared against the optimal set and against two significantly less aggressive options. The results are analyzed and conclusions drawn about effect of aggressiveness toward market share in Chapter IV.

Effect of Managing the SBU for Growth, Stability, Liquidation

This refers to growth, stability and liquidation of market share. The effect of aggressive growth was examined in the previous paragraph, but in this section comparisons were made among the three policies by selecting and evaluating those SBU market share options which were characterized as being stable in the one case and those which would liquidate market share in the other. The results and conclusions are dis-

cussed in Chapter IV.

The Effect of Limiting SBU Assets

The assets of the corporation were limited by selecting one particularly large and profitable option which had much lower assets , comparing the results obtained with this SBU with the results for other important sets of SBU. The analysis of results is reported in Chapter IV.

The Effect of Acquiring SBU with Specific Characteristics

The effect was investigated by using the optimal set of SBU options without the particularly large and profitable SBU , and by augmenting the set of SBU options with the large SBU which had , a large cash generation, a medium cash generation, and a small cash generation. The changes in the prospects of the combined company are analyzed and discussed in Chapter IV.

Joint Effects

Up to this point only the effect of each policy acting independently has been examined. To examine the joint effects requires investigating the response surface, but if this is done for all policies, the number of combinations to be examined makes the computer task completely impractical. However, two of the policies are particularly well suited for investigating the effect on a measure of success when they are allowed to vary jointly. Therefore, a more modest effort was undertaken which allowed a more thorough exploration of the joint effect between the dividend policy

and the debt to equity ratio policy for the present value of shareholder equity.

To accomplish this task a "map" was made of the optimal surface in the region bounded by $0.1 \leq \text{dividend rate} \leq 0.3$ and $0.3 \leq \text{debt to equity ratio} \leq 0.7$. This region includes a segment where the optimum solution is restricted, as well as a portion where it is not restricted. Generally a grid size of 0.1 was used, except an intermediate point on the debt to equity line at 0.45 was evaluated. Chapter IV analyzes the results.

V. PROBABILISTIC ASSUMPTIONS

It was the initial intent of the research to explore the probabilistic effects which occur when a probability distribution is associated with the contribution of each SBU market share option, as well as with the market share each option achieved. It was also hoped a distribution could be associated with the assets and liabilities of each SBU market share option, and the optimal set of SBU could be obtained under such conditions. However, as the work progressed it became apparent the computer program for the non-probability case would reach the maximum acceptable size for the computer, and in addition the time to execute an evaluation of a given set of SBU was at least five minutes, near the acceptable limit for interactive programs. Thus it was determined programming the total probability case was impractical.

The literature seems to indicate problems in handling probabilistic

assumptions. For instance, Wagner (17, p 659) states about stochastic linear programming,

... you will see that such a formulation magnifies the size of the problem. You will be justified in concluding that the more general situations modeled in Section 16.7 is likely to be beyond practicality for most real linear programming applications.

Such a conclusion is certainly true for interactive time sharing programs with problems the size of the model in this research.

The above notwithstanding, a probability distribution was associated with each asset account, the payables account, and the contribution of each SBU market share option. Instead of carrying the probabilities through either the optimization section or the evaluation option of the model, it was determined to obtain a probability distribution of the after tax profit attributable to a given set of SBU market share options and a probability distribution of the cash flows generated by this given set. As an intermediate step, a probability distribution of each asset account, the payables account, and the liquidation value (a total of six distributions for each year for each market share option) was obtained. These outputs should be quite valuable to the business planner, even though the model is not run to completion, because a great deal of the uncertainty in the model is generated from the sources which were assigned distributions rather than from the corporate items which were not. The planner can choose values from the output distributions at some satisfactory level of confidence and determine by further computation the effects on the balance

sheet. Thus the approach is intermediate between ideal and the deterministic one discussed in earlier sections, but it is judged to be valuable.

The research was carried out by using an arbitrary three-point probability distribution for each account involved. See Table XXVII of Appendix D for the assumed distributions. There are six values requiring a distribution for each SBU market share option for each year in the study, and thus for the five-year study horizon, with the twenty SBU and three market share options each, there are a total of 1,800 distributions required. Rather than assign a distribution for each of these values, which conceptually could be done, twenty different distributions were formulated. The three points chosen for the distribution were; 1) the deterministic value given in the planning input; 2) a percentage below this value; and 3) a percentage above the given value. The probabilities associated with these points were chosen arbitrarily, in such a way that the given value was not necessarily the mean of the distribution. The given values may be somewhat optimistic in general, and the mean of the three-point distributions chosen turned out to be somewhat less than the given value.

The Research

The research was carried out by using the optimal set of market share options found in the deterministic case for present value of shareholder equity. First, one of the twenty distributions was used for each of the 30 values requiring a distribution for each SBU market share option and the indicated output distributions were obtained. Second, a random

number generator, which is available in the Basic computer language (10), was used to choose one of the twenty distributions for each of the values requiring a distribution and again the indicated output distributions were assigned a probability of one, the other two points were assigned probability zero, and the program was rerun. Finally, the largest SBU, Number 18, market share option 1 was assumed to have been liquidated in the first year of the first procedure above and the program was rerun.

The purpose of the research steps was to establish the model as a means of 1) demonstrating that this limited probabilistic output can be obtained in a real problem, 2) examining some of the differences which result when different probability assumptions are made, 3) demonstrating the validity of the program through the degenerate case where the probability of the deterministic values are one, and 4) comparing results when the large SBU was not present.

The Mean and Variance

Well known probability theorems indicate that the mean of the probability distribution (which is the sum of a number of probability distributions which meet certain conditions) is the sum of the means of the distributions in question. In a like manner, the variance is the sum of the variances (8). Additionally the distribution, which is the sum of the distributions, approaches a normal distribution, as the number of individual distributions in the sum becomes large. The principal condition to be met for these

results to hold is for the individual distributions to be mutually independent. For other more technical conditions see Feller (8). For the purpose of this research, it is assumed the distributions are mutually independent. In practice, however, they are very likely only independent to an unknown degree; the variance in asset size, for instance, could have some effect on the probable profit. This effect is ignored in the approach taken, for to do otherwise requires taking the covariance into account, the problem being too big for the computer for such a large number of distributions.

The Total Probabilistic Program

The total probabilistic program could have been attacked in one of two ways. The first way would be as a simulation problem, where the specified input is drawn from probability distribution and the resulting value of the pertinent measurement criteria recorded. The sequence would have been continued until sufficient validity appeared in the output to terminate the simulation. But because this only would have yielded an evaluation of one set of SBU options for an extensive number of runs, it could not serve as an optimizing procedure. After enough runs it could give valid information on the probable outcomes of the one set of SBU options.

The second way would be to assume a relationship between the mean and the variance of the distribution of each input function and attempt to carry the parameters through the computations. The initial step of this

was done as discussed above, but it becomes difficult if the distribution parameters are carried through the restrictions imposed by the balance sheet.

Some further insight into the problem can be obtained by assigning different values to some of the key numbers in the SBU market share options and running the model to assess the effect. There is a good reason why this approach in conjunction with the limited exploration of probabilities carried out above may be adequate, and that is because in most cases very little is known about the nature of the probabilities associated with the numbers submitted by the SBU managers. These numbers tend to become self-fulfilling forecasts if accepted for implementation, and as such their distributions are hard to measure. Thus, if some idea of the nature of the distribution of profit and cash flow is known, much of the information possible will have been obtained.

VI. SUMMARY

The objectives of the research were discussed along with the details of the simulation used and the research programs undertaken. Much of the supporting detail was found in Appendix A. Five different measures of success were described in Appendix A, as were the appropriate techniques for optimizing the selection of SBU for each. The input, the output, and the restrictions on the computer program were discussed. Six different strategic policies were called out for research, and the research to invest-

igate these independently and in a limited case jointly was discussed. The problems associated with trying to devise a model under probabilistic assumptions were mentioned, as were the techniques for the limited investigation of probabilities which were carried out.

The next chapter discusses validation of the model, and because the model is deterministic and an "evaluation" type of model validation is easier than it would be for a probabilistic simulation type. The test program is described and the input data which were chosen from a specific company are discussed. The output of the model is described, and the results from the test of real data are discussed, as is the sensitivity of the results to the initial conditions. Specific research results, however, are left for Chapter IV.

CHAPTER III

MODEL VALIDATION

I. OVERVIEW

Because the mode is an "evaluation" type rather than the probabilistic type (which uses random data drawn from distributions), it is much easier to validate. The tests used to verify the accuracy of the computer programs are described, and a description of the real data used in the research is presented. The case to be modeled uses actual planning data supplied by a large international company headquartered in Portland, Oregon, and in addition utilizes the input of company personnel routinely involved in the planning process.

The output of the model is described, and the results for the specific choice of market share options the company chose are discussed. The sensitivity of the model to errors in data and differences in assumptions is examined, and conclusions are reached about the accuracy of the modeling process. The model is found to be accurate and a useful tool for pre-evaluating the results of specific planning actions which could be taken.

The model utilized in the research is fully described in Chapter II and Appendix A. The programs are detailed in Appendix B, and listings

of each computer program used are found there as well. Appendix C is a collection of specific run results and supports both this chapter and Chapter IV. Appendix D provides the input data used in the research study.

II. CLASS OF MODEL

The evaluation type of model is easy to validate because it is easy to prove the accuracy of output results for given input data used. In simulations using data drawn from probability distributions, it is necessary to determine if the results truly represent the output function of the system; probabilistic work and verification thus must be undertaken (12, 13, 14).

In the evaluation model, there are a large number of variables influencing the results of the simulation, but these variables nevertheless enter the computation in rather straightforward ways. Difficulty and complexity relate instead to the size of the problem involved. In this research, an added complexity involves restrictions on the output results and the integer nature of the decision variables.

There are twenty different SBU with three market share options each, and, with the possibility of liquidation of each SBU, there are eighty possible SBU market share options from which to choose the best twenty. The best market share options must be chosen for each SBU according to the measurement criteria and within the restrictions. The problem is computationally difficult if there are more than three of four such SBU.

It is easily seen that the computational capability of the evaluation model is a great aid for the size of the problem being investigated.

The calculation job is substantial even in the case where optimization is not required, and it simply is desired to compute the resulting balance sheet over a several period time horizon subject to appropriate restrictions. With the usual desire to try several alternative policy decisions for evaluation, the simulator becomes a very useful tool of the planning process. Hence, even though the model is deterministic, rather than probabilistic, it is comprehensive in nature and potentially quite useful.

III. VALIDATION

Two classes of validations which must be performed: The model must be computationally accurate, and the model must truly represent the real-world phenomenon it is supposed to represent. Meier (12) lists several procedures for validating both classes in complex programs.

Computational Validation

The programs found in Appendix B are sufficiently complex to be tested in segments, and the technique of putting in "windows" to print out intermediate results was used, with these results then checked by hand calculations. Because the full set of input data is too complex to use for model validation, a set of input data was contrived to test the computational aspects of the model. Each principal branch of the model was verified by hand computation and by modifying the input assumptions

of Table XXVI of Appendix D. In a similar manner, the integer programming assumptions of the model were verified by greatly reducing the debt to equity ratio restriction of the model, until the program was forced to find a restricted solution using the integer programming algorithm, and comparing the model results with hand-computed values.

The probability research program outlined in Chapter II was completed after the rest of the research was finished, and the results of the model using deterministic data were thus available for comparison. The probability program was found to be arithmetically accurate by hand computation, further verified by assigning probability equal to one to the given planning input data and probably equal to zero to the other two points in the three-point distribution used in the investigation. The results matched those obtained using the deterministic programs.

Because the three-point distributions were chosen quite arbitrarily by the author it was not possible to check their validity; however, it is possible to establish their plausibility. There are twenty such distributions in total, and assuming the deterministic input value is a value of unity, the average of the means of the distributions is 0.9435, thus tending to compensate for the assumed optimism in the input data. The average of the variance of the distributions is 0.025 and the standard distribution is 0.158. It can be shown the sum of the distributions approaches a normal distribution as the number of distributions becomes large, using well known probability theory. If the sum is normally

distributed, the case represented by the total distribution indicates that 95.5% of the time the profit of an SBU market share option, with a planned profit of one dollar, would be expected to lie in the range $\$0.6275 < \text{profit} < \$1,2595$. Alternately, for an SBU with \$10,000 of planned profit, there is a 95.5% chance that the profit will be in the range $\$6,275 < \text{profit} < \$12,595$. This is at least a plausible value for the likely range of profits in such an operating SBU. Of course, some of the three-point distributions would be more or less dispersed than the "typical" one described.

Validation of Assumptions

There are a number of assumptions implicit in the computational procedures of the model. One important one is how the planned results of each SBU combine to represent the entire corporation. This has been done at the end of each time period by "generally accepted" accounting rules for consolidation. However, the assumption that these entities can be consolidated must be recognized. In an actual international company facing currency exchange regulations, dollar devaluations, and restrictions on the use of funds, these assumptions may not hold, but the effect was regarded as not material to the purpose of the research. If restrictions of this general type are significant in a given situation, they could be programmed as restrictions in the section of the program doing the consolidation.

The assumptions in Table XXVI of Appendix D (parallel to Figure 13 of Appendix A) are those in use at the company providing input data, and to

this extent thus reflect reality. Most of the factors called for in Figure 13 have an acceptable range which depends on the risk orientation of company management and the industry in which the company is engaged (9).

It is assumed that each of the input data resulting from each market share option of each SBU is a completely accurate forecast of the results which will be obtained by operating with that strategy. This, of course, is not absolutely true; each item of input data is in reality only a point in some probability distribution. But as pointed out in Chapter II, with the probabilistic nature of the whole problem computationally too difficult, the probable cash flow and probable profit of the set of SBU market share options were instead investigated as described. In a sense, the market share options of the SBU are self-fulfilling forecasts, because in practice they become budgets for the people managing the SBU, and management pressure is applied to try to achieve the indicated results. This influences the variance of the distribution of the input data, acting to limit the natural dispersion of data.

There is an assumption the SBU are independent of each other and of the non-company environment in which they operate, and although this is approximately true for many SBU, there certainly exist examples where they are independent neither of one another nor of the business environment. One example is where one SBU has sales to another SBU in the same company. Although the planning was done with the effect of such sales eliminated in the data used in this investigation, it is a problem in

general. It can sometimes be handled by eliminating the effect from the data as it was in the cases here or by restructuring the SBU (such as combining two which have large transactions with each other into one).

As a second example, the success of the SBU might so change the business environment that the anti-trust division of the government would restrict the SBU because it has become too large a factor in the market place. Another example is where the stock market, recognizing its success or failure, has changed the extent to which the company can borrow money. Such effects are ignored in the model because the basic assumptions are that the results developed for each SBU are independent and feasible.

Because it is based on the real planning information upon the accuracy of which people's livelihood depended, the model is believed to be reasonably representative. Further, the model follows the same accounting rules for combining the data as does the manual system employed by the planners who routinely use the data. The information has a historical base, and the alternative market share assumptions chosen by the company are available for critique. Some aspects of the real data are described in the next section.

IV. DESCRIPTION OF THE SET OF SBU

Table I and Table II (which continues Table I) characterize the nature of the set of SBU used in the research, and the complete input data files

TABLE I
THE SET OF SBU USED IN THE RESEARCH

SBU No.	Market Share Strategy (Company Strategies are marked *)	Range of Market Share over 5 years (%)	Aggressiveness Toward Growth
1	1*	27.9 - 36.0	High
	2	27.7 - 27.7	Even
	3	27.7 - 20.0	Low
2	1*	35.1 - 44.0	High
	2	34.1 - 32.7	Even
	3	35.1 - 20.0	Low
3	1*	9.3 - 20.8	High
	2	10.7 - 9.7	Even
	3	9.3 - 6.0	Low
4	1*	0.8 - 3.8	High
	2	0.9 - 0.9	Even
	3	0.9 - 0	Low
5	1*	35.8 - 42.3	High
	2	35.0 - 35.0	Even
	3	35.8 - 20.0	Low
6	1*	46.4 - 50.5	High
	2	40.0 - 40.0	Even
	3	46.4 - 30.0	Low
7	1*	12.8 - 21.7	High
	2	11.0 - 11.5	Even
	3	12.8 - 8.8	Low
8	1*	79.9 - 81.8	High
	2	79.9 - 79.9	Even
	3	79.9 - 54.0	Low
9	1*	10.3 - 21.7	High
	2	10.3 - 10.0	Even
	3	11.0 - 0.5	Low

TABLE II
CONTINUATION OF TABLE I

10	1	10.0 - 16.0	High
	2	10.5 - 10.5	Even
	3*	10.5 - 5.9	Low
11	1*	13.5 - 29.2	High
	2	14.7 - 11.7	Even
	3	13.5 - 8.0	Low
12	1	33.5 - 37.5	High
	2*	33.5 - 23.3	Even
	3	33.5 - 17.7	Low
13	1*	25.0 - 27.8	High
	2	25.0 - 25.0	Even
	3	28.3 - 17.3	Low
14	1	15.4 - 20.0	High
	2	15.4 - 10.4	Even
	3*	23.1 - 16.1	Low
15	1	7.7 - 8.2	High
	2*	10.5 - 10.7	Even
	3	6.6 - 5.2	Low
16	1*	17.7 - 22.4	High
	2	15.7 - 16.5	Even
	3	15.7 - 11.0	Low
17	1	42.7 - 50.0	High
	2*	42.1 - 42.7	Even
	3	41.3 - 36.8	Low
18	1	61.0 - 70.0	High
	2*	61.0 - 64.0	Even
	3	49.0 - 29.4	Low
19	1*	22.1 - 33.5	High
	2	18.2 - 21.6	Even
	3	22.1 - 14.0	Low
20	1*	0 - 31.4	High
	2	8.0 - 13.0	Even
	3	0 - 9.5	Low

for all SBU are found in Table XXII through XXVI of Appendix D. The descriptive titles of the SBU are not shown in order to disguise the nature of the business. Table I and II show the data has a wide range of values possible with regard to probable market share. There is a range in aggressiveness toward market share from highly aggressive, to passive, to liquidation of the business.

In the research, only twenty SBU out of a possible thirty were used, the other ten were withheld to limit the size of the problem. The company has since seen fit to reduce the number to sixteen by liquidating and combining. The beginning balance sheet data in Table XXII of Appendix D was scaled to take into account the actual reduced nature of the company. The balance sheet was kept in approximately the same proportion as it was in the company's published balance sheet.

V. RESULTS OF THE MODEL USING THE BASE CASE

The output of the model is discussed in Chapter II and Chapter IV with specific computer output found in Appendix C. The purpose of this section is to discuss the results which were obtained by using the model on the real input data and evaluating the results for the same SBU market share options which were chosen by the company. The resulting output is found in computer run AO of Appendix C, and this case is also used in some of the analysis of results found in Chapter IV. It is advisable to read the explanation of the data formats contained in Appendix C for a

complete understanding of the output results.

Run Time

The initialization phase of program ER2 (See Appendix B) runs about seven minutes for the pure evaluation case. The optimum case runs an additional 25 minutes if all files must be processed; although these programs need not be rerun unless results for new measurement criteria are desired. The balance sheet building phase of program ER6 runs about five minutes, or one minute per year in the planning horizon, and as such is near the upper limit of acceptability for interactive timesharing. Because the model was competing for time with regular batch process jobs which were running concurrently, the particular computer software chosen for this research (IBM Basic ITF) (10), and the computer used were slower than a commercially available software program. A given case requires about ten minutes of terminal connect time once the initialization phase is complete when running in the environment described. However, the probability case requires about 30 minutes of terminal connect time to complete.

Results

The output found in computer run AO indicates seemingly acceptable financial results. The company is expected to experience a growth in earnings per share of 46.6% over the five year period; an increase in dividends from \$0.37 to \$0.54 per share; growth in sales of 46.3%; growth in assets 61.8%; and total cash generation of \$ 9,422 million.

The company could do better, as we will discuss in Chapter IV.

Validation

Validation of the computations was achieved using test data. Running the real data resulted in further validation, because combinations of effects existed which had not been apparent with only test data. Hand computation proved that the many restrictive calculations applied against the balance sheet were being properly met, with a few subtle program "bugs" uncovered before the program satisfactorily met all of the criteria.

One validation test on real data, once the program is known to compute as it should, is the test of reasonableness, wherein the balance sheet entries must appear to be in the correct proportion to each other and must stay in good proportion throughout the study horizon. The results portrayed in computer Run AO seem to meet this criterion.

How well does the simulation actually forecast the results achieved in practice? At first it was thought it would be possible to measure this. More likely what would be measured is how well the people preparing the planning input data for the SBU, did their job not how well the model computed the given input data. A "field" comparison of projected results to actual does not test the validity of the model.

VI. SENSITIVITY

Initial Conditions

One of the important factors which must be checked is the sensitivity

of the model to initial conditions (12). Had the company been short of cash rather than in a "strong" cash position, the results would have been different. First, it may not have been possible to meet all of the boundary conditions and some conditions probably would have been relaxed (for instance the debt to equity ratio or dividend rate). In the way assets or profits from SBU operations reach the company profit and loss statement and balance sheet, the model is linear, with the changes resulting from modifications of the input easily estimated without running the model. For instance, if the profit of an SBU is increased by \$1,000 after taxes, this will result in an \$800 increase in equity, a \$200 increase in dividends, and an \$800 change in some combination of an increase in investment or decrease in debt -- depending on what restrictions are in force. Whether such a change is significant or not is judgmental; the important thing is that the linearity of the computational portion of the model makes sensitivity analysis easier. Such sensitivity analysis can of course be carried on by making an incremental change in the input and examining the resulting change by operating the model. But because of the way input variables enter the computation, this is unnecessary. Thus it is relatively easy to establish the effect of a change in any one variable on the final output.

Errors in Input

The other sensitivity condition which normally should be explored is output changes which result if there are recording or transcribing errors in the input data. The remarks under the last sub-section are appropriate

here as well, and because the input variables enter in a linear fashion, their effect can be easily computed by hand or by simple investigation using the model.

VII. SUMMARY

The validation of the model was described using test data as well as real company data, the latter evaluated for the set of SBU market share options the company had chosen for itself. Although tests of reasonableness and computational accuracy were applied, it was not useful to compare actual results obtained in the field with the prediction of the model, because the variations in field results came from differences in SBU planning data, not from differences in the model. The validation of the model for the limited probability research was described in some detail.

It was pointed out the model is deterministic in nature (an evaluation model) and not a probabilistic model using data drawn from distributions; however, some abbreviated probabilistic investigations were performed.

A description of the SBU input data was presented and the results of the model using the "base case" data was presented as a base for discussing sensitivity to initial conditions and errors in input. It was noted, because the variables entered the model in linear ways, it was relatively easy to establish the effect any one would have on the final results, and this could be done either by hand computations or by running test cases through the model. It also was noted different assumptions of initial

balance sheet conditions, particularly cash, can have a significant effect on company results in the ensuing years.

The next chapter discusses the results of the research program described in Chapter II and analyzes the large number of situations which were investigated.

CHAPTER IV

DISCUSSION OF RESULTS

I. OVERVIEW

This chapter discusses the results of the research program described in Chapter II and presents a summary of the cases run on the computer . Analysis of results obtained for each of the six policies and five measurement criteria investigated is presented, assuming each policy is independent. Later there is a short exploration of the joint effects between the debt to equity ratio and the dividend policy, using the present value of shareholder equity as a measurement criterion. Results from the limited investigation into probabilistic effects are also presented.

There are a number of results and conclusions examined in detail in the chapter, some of which follow. Dividends decrease the rate at which a company can grow, because dividends consume cash which then cannot be used for funding new opportunities. The limit on debt to equity ratio has a predictable and extensive influence on the rate at which a company can grow if the optimum set of SBU are restricted, but if there is sufficient cash available to fund the best set of SBU options, the ratio does not have such an effect. Aggressive growth in market share requires considerably more cash than does a strategy of managing for stability. However, over

the long run aggressive growth may generate more cash than does a policy of maintaining a stable market share. A particularly good use of the model would be in the evaluation of candidates for acquisition. The model is a great arithmetical aid because many of the computations, although simple in form, are complicated by their large number and the restrictions placed on the balance sheet.

Other results are mentioned, most importantly the effect of using return on assets employed as a measurement criterion; it seems this may unduly restrict the future earnings of the corporation. Some results of using the algorithm for finding the restricted optimum set of SBU market share options are mentioned, including the technique employed with the interactive computer program.

A great deal more data is available in computer outputs found in Appendix C than can be presented in the written discussion in this chapter -- in fact, a complete analysis of each attempted case could be a complete chapter. Hopefully, essential aspects of each case are presented in sufficient depth to emphasize important differences.

II. THE CASES EXAMINED

Developed to handle cases where all values of the input data are assumed to be deterministic, the model does not handle situations where certain variables are assumed to be drawn from probability distributions. While a limited investigation into the probabilistic effects is presented,

it is carried neither to an optimal solution nor a complete evaluation. This chapter discusses two complete types of cases. In the simplest case, the market share strategies to be evaluated are given, with the resulting corporate balance sheet calculated, the restraints applied, and the SBU market share options assumed to meet the imposed restraints. If the restraints cannot be met, it is assumed sufficient equity can be raised. This option is economical to run, giving indicative values while seeking information about the effects of using specific strategies.

The second type of case is more complex, using the optimization routine to obtain the set of SBU and their market share strategies which maximize a specific measurement criterion within given restraints. This case does use much more computer time, however, and hence is more costly to use. The run time is a function of the number of SBU, the time horizon, and how many cycles must be completed before the solution meets the restraints. In the case that the maximum solution does not violate the restraints, it takes about the same amount of computer time as the first type of case.

The computer programs composing the computer model are found in Appendix B, and the listings may be used to duplicate or extend the results reported on here. It probably would be desirable, however, to reprogram them if a different computer is to be used.

The real data and most aspects of the model have been discussed in previous chapters, and the computer printouts resulting from carrying

through the research program described in Chapter II and Appendix A are found in Appendix C.

The several computer runs made to examine the five measurement criteria called for in the research program are summarized in Tables XVIII through XX of Appendix C, and are discussed in the appropriate sections of this chapter. As can be seen from Tables XVIII through XX and Figure 7, it was possible to reduce the number of runs significantly, using one optimal run as a comparison base. Because the company generated sufficient cash, it did not need to seek a restricted optimum in a large number of cases.

Investigation of all policies with all measurement criteria was unnecessary. Using the present value of shareholder equity as a measurement criterion, Policies III through VI were investigated. The analysis would not have been changed appreciably by selecting the optimum SBU market share option resulting from other measurement criteria, because they gave very similar optimum sets. For the SBU market share options which resulted in the optimum for each measurement criterion, see Table XXI in Appendix C.

Three measurement criteria were found to have the same optimum set, further reducing the number of separate computer runs. As can be seen from Figure 7 and Tables XVIII through XX, these cases were I, III and IV -- namely, the present value of shareholder equity, growth in total assets, and total assets. While there should be no reason for these to always

Policies¹

- I - The Dividend Policy
- II - The Debt to Equity Ratio Policy
- III - The Policy on Pricing to Obtain Market Share
- IV - Effect of Managing the SBU for Growth; Stability; Liquidation
- V - The Effect of Limiting SBU Assets
- VI - The Effect of Acquiring SBU with Specific Characteristics

Measurement Criteria¹

- CASE I - Present Value of Shareholder Equity
- CASE II - Growth in Earnings per Share
- CASE III - Growth in Total Assets
- CASE IV - Ending Total Assets
- CASE V - Growth in Sales

¹ For a discussion of the policies and measurement criteria see Chapter II and Appendix A.

Figure 7. Policies and measurements investigated in the research.

result in the same optimum set, they probably are highly correlated in many cases. For the specific data set being investigated they simply resulted in the same set of SBU options.

III. THE DIVIDEND POLICY

The evidence seems rather conclusive that the dividend policy has a significant effect on the long-run success of an enterprise. But this statement must be qualified -- as must most conclusions in this report -- because the results are for the particular enterprise under investigation. Other company situations could show somewhat different findings.

The computer output for this investigation is labeled A1, A2, B1, B2, E1, and E2 in Table XVIII. Using the five measurement criteria to investigate how the optimal values changed for different dividend rates, the dividend policy was explored. Table III records the results of the computer runs. Over the ranges investigated, the growth in sales was not affected by changes in dividend policy because the optimum set of SBU market share options was not restricted. Hence, the same market share options were being pursued.

Because the optimal set of SBU market share options was changed, the effects are those which are independent of the SBU operations. With the same operating units therefore producing the same profits, it is seen that company management can significantly influence the results by changes in the dividend policy.

TABLE III
OPTIMUM VALUES OF THE MEASUREMENT
CRITERIA AS INFLUENCED BY
THE DIVIDEND POLICY

Measurement Criteria	Dividend Rate as a Percent of Earnings		
	10%	20%	30%
Present Value of Shareholder Equity ¹ (millions of \$)	167.2	159.4	153.1
Growth in Earnings Per Share (%) ²	67.9	64.2	59.7
Growth in Total Assets (%) ²	73.0	65.8	57.9
Ending Total Assets (millions of \$)	103.6	98.1	93.3
Growth in Sales (%) ²	55.1	55.1	55.1

¹ If the present value of equity is adjusted downwards for equity sales made and this effect is removed, the numbers are, 167.2, 158.1, 149.2.

² See Appendix A for definition of growth.

Dividends are paid out of equity. This is why the present value of shareholder equity (as well as some of the other criteria) are affected to such a large extent. For the case using a 20% dividend rate and the shareholder equity as a criterion, the cash paid out in dividends totaled \$10,716 million for the five-year period. This is a significant amount of money to withhold from investment, when assets at the beginning of the first year total only \$59 million.

IV. THE DEBT TO EQUITY RATIO POLICY

The effect of debt to equity ratio policy on the present value of shareholder equity is minimal, unless the market share options are changed. But as shown in Section IX of this chapter, such a change does materially reduce shareholder equity.

The computer output for this investigation is labeled A1, A3, B1, B3, E1, and E3 in Appendix C, and the debt to equity ratio policy was explored, using the five measurement criteria and investigating how the optimal values changed for different debt to equity ratios. Note in Table IV which records the results of the computer runs, that the present value of shareholder equity is given in both an adjusted and unadjusted form. The adjusted value is found by removing the present value of the new equity purchased from the unadjusted value shown. While this is done to give a better comparison because equity could have, in other cases, been purchased, it was not necessary to meet the restrictions.

TABLE IV
OPTIMUM VALUES OF THE MEASUREMENT
CRITERIA AS INFLUENCED BY
THE DEBT TO EQUITY RATIO

Measurement Criteria	Debt to Equity Ratio		
	.45	.50	.60
Present Value of Shareholder Equity ¹ (millions of \$)	171.5	167.2	159.4
Growth in Earnings per Share (%) ²	53.1	56.8	64.2
Growth in Total Assets (%) ²	66.4	66.2	65.8
Ending Total Assets (millions of \$)	98.5	98.3	98.1
Growth in Sales (%) ²	55.1	55.1	55.1

¹ If the present value of equity is adjusted downwards for equity sales made and this effect is removed, the numbers are, 158.7, 158.5, 158.1.

² See Appendix A for definition of growth.

Again, growth in sales was not changed by changes in the debt to equity ratio over the range investigated. Had the optimal set of SBU market share options changed, because balance sheet restrictions could not be met by raising new equity, sales growth would also have been reduced by a reduction in the debt to equity ratio.

The present value of unadjusted shareholder equity is significantly larger for low debt to equity ratios than for large ratios, because in the model new equity is raised to meet the debt to equity restriction. After the present value of this new equity has been removed, there is very little difference apparent; almost all of the difference would be removed if the effect of the new equity is also reduced by the amount it increases earnings. Therefore, the increase in shareholder equity, for the reduced debt to equity ratio in Table IV, is viewed as a spurious result. But it must be recognized that shareholder equity would be significantly reduced if a restricted set of market share options were required.

Because a different number of shares are outstanding in each case, the growth in earnings per share is deceiving. If actual earnings are considered, earnings show very nearly the same pattern as do assets. The conclusion reached above holds that the effect of the debt to equity ratio depends on whether it restricts the optimum set of SBU options. Its effect on the balance sheet seems to be minimal for the company under investigation, since in the range shown the same set of SBU options are in use.

V. THE POLICY ON PRICING TO OBTAIN MARKET SHARE

The computer output results for this investigation are labeled A1, A4, and A5, in Appendix C, and the effect of pricing to obtain market share was investigated by evaluating the set of SBU market share options which gave the largest, medium, and minimum market share. While Table V compares results for the optimum values of the five measurement criteria used, Table VI provides a comparison for other important operating criteria. The data in Table VI is for the final year of operation in the planning period, and was chosen as a way of comparing alternatives, and as a way to answer questions about the long range results.

The comparison of profits in the final year among the market penetration cases is particularly significant. Another important effect is that under low market penetration, more cash is generated (\$13.7 million) than under high penetration (\$8.3 million). In the first instance, market position is being liquidated; in the second, cash is being invested into inventories, receivables and other assets to produce the growth.

It seems a policy to increase market share (frequently done through pricing) results in a significantly stronger company. This conclusion is justified by the fact that most of the measurement criteria are more favorable for maximum market share penetration case than for the minimum market share penetration case. It does, however, require significantly more cash.

VI. THE EFFECT OF MANAGING FOR GROWTH STABILITY OR LIQUIDATION

The effect of managing the SBU for growth, stability, or liquidation

TABLE V
COMPARISON OF MEASUREMENT CRITERIA
FOR A WIDE RANGE OF MARKET
SHARE PENETRATION

Measurement ¹ Criteria	Optimum Value	Max.Mkt. Share Value	Med.Mkt. Share Value	Min.Mkt. Share Value
Present Value of Shareholder Equity (millions of \$)	159.4	158.4	152.3	118.5
Growth in Earnings per Share (%) ²	64.2	63.0	31.4	-13.7
Growth in Total Assets (%) ²	65.8	65.2	56.1	18.3
Ending Total Assets (millions of \$)	98.1	97.3	90.5	67.4
Growth in Sales (%) ²	55.1	55.1	26.1	-14.3

¹ All of the runs were made with a dividend rate of 20% and a debt to equal ratio of 0.60.

² See Appendix A for definition of growth.

TABLE VI
COMPARISON OF KEY OPERATING
CRITERIA FOR A WIDE RANGE
OF MARKET SHARE
PENETRATION

Measurement * Factor	Max.Mkt. Share	Med.Mkt. Share	Min.Mkt. Share
Sales in Final Year (millions of \$)	114.2	90.5	58.0
Debt to Equity Ratio in Final Year	.29	.31	.44
Return on Equity in Final Year (%)	19.6	16.7	14.5
Dividends/share in Final Year	.59	.47	.28
Total Cash Generated (in millions of \$)	8.3	14.6	13.7
Cash Held as Invest- ment in Final Year (millions of \$)	16.4	22.9	23.5
Profit in Final Year (millions of \$)	13.5	10.7	6.3

* All of the runs were made with a dividend rate of 20% and a debt to equal ratio of 0.60 and the set of SBU options which are optional for measurement criteria 1.

is very similar to the policy used in the investigation of market penetration. Tables V and VI should be considered for this case as well, and many of the same conclusions can be reached as found in the previous section. One significant difference in interpretation between the two sections is the amount of cash available for investment in the final year of the study period. If it is desirable to accumulate a large amount of cash for such purposes as acquisition or hedge against depression, a company might be less aggressive about obtaining increased market share. Although it seems almost trite, a stable strategy toward market share increases cash reserves.

VII. THE EFFECT OF LIMITING SBU ASSETS

The computer output results for this section are labeled A1, A4, A5, and A6, in Appendix C. While much of the information for the analysis of this section is also contained in Tables V and VI, more information was developed to help analyze this case, using the model to evaluate a set of SBU market share options which had greatly reduced assets. One SBU, Number 18, is significantly larger than the others and is very profitable with a large return on assets, as shown by the input data found in Appendix D. The model was run assuming all SBU, except Number 18, were liquidated and the cash brought into the balance sheet. The aggressive market share option of Number 18 was used, however. Tables VII and VIII are the same as Tables V and VI, except that the results of run A6 have been added to the right-hand column.

TABLE VII
COMPARISON OF MEASUREMENT
CRITERIA FOR A WIDE RANGE
OF MARKET SHARE
PENETRATION

Measurement ¹ Criteria	Optimum Value	Max. Mkt. Share Value	Med. Mkt. Share Value	Min. Mkt. Share Value	With Greatly Reduced Assets
Present Value of Shareholder Equity (millions of \$)	159.4	158.4	152.3	118.5	142.2
Growth in Earnings per Share (%) ²	64.2	63.0	31.4	-13.7	24.8
Growth in Total Assets (%) ²	65.8	65.2	56.1	18.3	50.2
Ending Total Assets (millions of \$)	98.1	97.3	90.5	67.4	79.5
Growth in Sales (%) ²	55.1	55.1	26.1	-14.3	26.1

¹ All of the runs were made with a dividend rate of 20% and a debt to equal ratio of 0.60.

² See Appendix A for definition of growth.

TABLE VIII
COMPARISON OF KEY OPERATING
CRITERIA FOR A WIDE RANGE
OF MARKET SHARE
PENETRATION

Measurement ¹ Factor	Max. Mkt. Share	Med. Mkt. Share	Min. Mkt. Share	With Greatly Reduced Assets
Sales in Final Year (millions of \$)	114.2	90.5	58.0	38.2
Debt to Equity Ratio in Final Year	.29	.31	.44	.33
Return on Equity in Final Year (%)	19.6	16.7	14.5	15.5
Dividends/Share in Final Year	.59	.47	.28	.39
Total Cash Generated in Millions of \$	8.3	14.6	13.7	35.8
Cash Held as Invest- ment in Final Year (millions of \$)	16.4	22.9	23.5	44.5
Profit in Final Year (millions of \$)	13.5	10.7	6.3	8.9

¹ All of the runs were made with a dividend rate of 20% and a debt to equal ratio of 0.60 and the set of SBU options which are optional for measurement criterion ¹.

The results reflect things expected to happen, were large amounts of assets changed into cash and the cash invested. But the earnings are modest by comparison, despite the fact a great deal of cash is invested, because the pretax return on invested cash is assumed to be only eight percent (8%), while after-tax return on equity is found to be 15.5%. The results, with just the aggressive option of SBU Number 18 present, are superior to the results of the entire set of SBU using the least aggressive option, and the results demonstrate how one superior SBU can contribute a great deal to the profitability of a company. The single SBU shows how a company, in divesting many of its less profitable assets, could make a very acceptable return (\$8.9 million in profit, which is only \$4.6 million less than with maximum market share), and have \$28.1 million more cash available for acquisition or other corporate purposes. This may or may not be desirable for any one company, but the possibility of obtaining such results may be of a great interest, showing as they do the flexibility of the model.

VIII. THE EFFECT OF ACQUIRING SBU WITH SPECIFIC CHARACTERISTICS

The computer output results for this investigation are labeled A1 and A7, and the effect was investigated by again using the extraordinarily large results from SBU Number 18. Four runs in total are used to draw conclusions about this effect; these runs contain the four possible values of market share options for SBU Number 18 which are 0, 1, 2, and 3

respectively. The run with market share option equal to zero is considered to be the case of a company which wants to acquire a new SBU, and each of the alternatives using market share options 1, 2, and 3 are then considered for the effect on the financial results of the company after the acquisition of one of the three "new" SBU. Table IX summarizes the results of the four computer runs, where some interesting statistics resulted. The runs were made using the present value of shareholder equity as the maximization criterion, and show that future aspects of the company could be greatly improved by option 1 or 2 and would be helped by option 3. It is beyond the scope of this research to speculate on the price at which the acquisition could be made, and the decision-making group of the company must determine the price they are willing to pay to become a company with the characteristics shown for the combined companies. Thus, although a great deal more analysis would be required to determine if the acquisition is practical, the technique demonstrated here could be of great value. The probabilistic techniques described in Section X of this chapter would also be of value, and although they do not go to sufficient depth to be comparable with the results shown in Table IX, they would be useful in an acquisition analysis.

IX. A CONSIDERATION OF JOINT EFFECTS

The computer output results for this investigation are labeled J1 through J13 and A1, A2, and A3. As described in Chapter II, an investi-

TABLE IX
COMPARISON OF KEY OPERATING RESULTS WHEN AN SBU WITH
SPECIFIC CHARACTERISTICS IS ACQUIRED

Measurement Criteria	Company Without SBU # 18	Company With SBU #18 - 1	Company With SBU #18 - 2	Company With SBU #18 - 3
Present Value of Shareholder Equity (millions of \$)	103.8	159.4	156.1	124.9
Growth in Earnings per Share (%)	444.2	61.2	45.7	31.5
Growth in Total Assets (%)	28.0	65.8	62.2	34.0
Ending Total Assets (millions of \$)	60.2	98.1	95.0	76.6
Growth in Sales (%)	73.5	54.2	49.8	43.0
Sales in Final Year (millions of \$)	76.6	114.8	111.5	98.1
Debt to Equity Ratio in Final Year	.42	.29	.30	.40
Return on Equity in Final Year (%)	12.8	19.6	18.3	19.6
Dividends/Share in Final Year (\$)	.21	.60	.54	.43
Total Cash Generated (millions of \$)	-0.6	7.9	7.9	-1.3
Cash Held in Final Year (millions of \$)	9.3	16.0	16.1	8.2
Profit in Final Year (millions of \$)	4.9	13.6	12.2	9.7

gation of the joint effects between the two strategic policies, debt to equity ratio and dividend rate, were carried out, and Table X and Figure 8 summarize the results. The results were obtained using the present value of shareholder equity as a maximization criterion for the various combinations of dividend rate and debt to equity ratio limits shown in Table X. Some of the combinations were not possible within the restrictions, and hence restricted optima were required for Runs J9 through J13, the five most restrictive combinations. For the combinations where restricted optima were required, there is an entry in Table X under the column labeled Present Value of Shareholder Equity of Liquidated SBU. The present value of shareholder equity was adjusted by removing the present value of new equity sales, because if required, new equity could also have been raised. To render the cases comparable, it was desirable to make such an adjustment.

Figure 8 demonstrates that the present value of shareholder equity (adjusted), is very nearly a plane in the three dimensions shown, except for the effect of incurring a restricted optimum. The restricted optimum is quite probably less than a true optimum, but it is obtained by the operator of the model, as explained elsewhere. The operator must exercise judgment about which SBU should be reduced or liquidated, basing such judgment on factors outside the model's assumptions. In any case, the restrictions force the true optimum to be less than the extended plane, which represents the present value of shareholder equity for the unrestricted optimum.

TABLE X
THE PRESENT VALUE OF SHAREHOLDERS EQUITY
CORRESPONDING TO JOINT VALUES OF DEBT
TO EQUITY RATIO AND DIVIDEND RATE
(Thousands of Dollars)

Debt to Equity Ratio	Dividend Rate	Present Value of Shareholders Equity	Present Value of Shareholders Equity	Present Value of Shareholder Equity of Liqui- dated SBU
		<u>Unadjusted</u>	<u>Adjusted</u>	
0.3	0.1	179.5	165.8	4,431.1
	0.2	175.0	157.3	5,330.6
	0.3	162.7	143.2	8,203.2
0.4	0.1	182.6	168.1	-
	0.2	174.2	158.9	866.7
	0.3	162.9	146.1	4,339.3
0.45	0.1	177.9	167.8	-
	0.2	171.5	158.7	-
	0.3	165.1	169.7	-
0.5	0.1	173.6	167.5	-
	0.2	167.2	158.3	-
	0.3	160.8	149.2	-
0.6	0.1	167.2	167.2	-
	0.2	159.4	158.1	-
	0.3	153.1	149.2	-
0.7	0.1	167.3	167.3	-
	0.2	158.1	158.1	-
	0.3	149.0	149.0	-

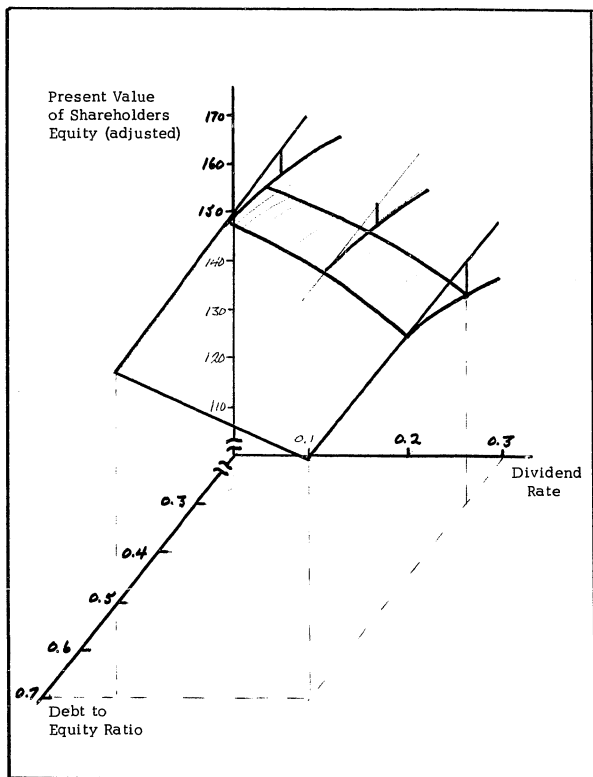


Figure 8. The present value of shareholders equity as a function of the debt to equity ratio and dividend rate.

Using Figure 8, it is possible to forecast the results of any combination of dividend rate and debt to equity ratio in the region where the function is linear, and hence no further investigation in that region is warranted. Because the surface is not smooth, predicting the results of any given combination is difficult in the region where restricted optima are involved. Because of the integer nature of the problem, the surface is composed of a cluster of parallelepipeds subject to the choice of SBU options made by the operator of the model.

X. THE PROBABILISTIC CASE

As explained in Chapter II, the probabilistic research was confined to obtaining the mean and variance of the profit and of the cash flow distributions as computed for a given set of SBU market share options. For cases in which the central limit theorem holds, the distribution found will be approximately normally distributed. A beginning company balance sheet similar to Table XXII of Appendix D was used, in conjunction with the set of SBU market share options found when the present value of shareholder equity was optimized (Computer run A1, Table XXI). The beginning balance sheet had such large assets, compared with those required by the set of SBU used, that a large cash flow resulted in the first year. Because the input balance sheet represents given historical information, it was assumed to be a one-point probability distribution with variance zero, and therefore, the variance of the cash flows were less in the first year than in subsequent years. (Program ERP of Appendix B gives the precise definition of the tech-

nique used.)

The use of the output results in a real situation is rather obvious. The planner or decision-maker can gauge the likelihood of generating a certain level of profit and cash flow, and if this level is not sufficient, he may take steps to add other SBU, delete poorly performing SBU, or act to reduce the possible variances in critical SBU. Computer output such as found in Tables XI through XIII and in Appendix C would be a good aid in making such decisions.

Results for Assigned Three-Point Probability Distributions

Table XI and computer Run P1 record the results obtained for the arbitrarily assigned three-point probability distributions. Using the normal distribution and the results in the fifth year for the case in Table XI, it is found that 95.5% of the time (the mean plus or minus two standard deviations), the cash generated will lie in the range $\$4,003 < \text{cash flow} < \$15,903$. In a similar manner 95.5% of the time the profit in the fifth year can be expected to lie in the range of $\$12,360 < \text{profit} < \$15,946$. The dispersion is so much less in the case of profit than it is in the case of the cash flow because of the number of sums required to obtain the total distribution for the cash flow. For a given year, twenty random variables need to be summed to find profit, inventory, receivables, net value of plant, and payables. To find total assets plus profit for a given year, these must be combined algebraically. To determine the cash flow, the assets for a given year must be subtracted from the assets of the

TABLE XI

RESEARCH RESULTS OF THE PROBABILITY INVESTIGATION
 USING TWENTY ASSIGNED THREE-POINT
 PROBABILITY DISTRIBUTIONS
 (Thousands of \$)

Year	Expected Cash Flow	Variance of Cash Flow	Expected Profit	Variance in Profit
1	32,901	3.20×10^6	9,456	5.51×10^5
2	6,187	6.08×10^6	10,171	5.59×10^5
3	6,339	6.80×10^6	11,222	6.20×10^5
4	8,363	7.83×10^6	12,841	7.49×10^5
5	9,953	8.83×10^6	14,153	8.08×10^5

TABLE XII

RESEARCH RESULTS OF THE PROBABILITY INVESTIGATION
 USING RANDOMLY GENERATED NUMBERS TO
 CHOOSE ONE OF TWENTY THREE-POINT
 PROBABILITY DISTRIBUTIONS
 (Thousands of \$)

Year	Expected Cash Flow	Variance of Cash Flow	Expected Profit	Variance in Profit
1	32,718	8.92×10^6	8,565	2.73×10^6
2	4,233	11.51×10^6	9,604	1.58×10^6
3	7,711	12.72×10^6	10,965	0.80×10^6
4	8,532	21.41×10^6	12,862	3.69×10^6
5	9,809	19.87×10^6	13,724	2.00×10^6

TABLE XIII

RESEARCH RESULTS OF THE PROBABILITY INVESTIGATION
WITH SBU NUMBER 18 LIQUIDATED IN YEAR ONE
OF THE STUDY AND WITH ASSIGNED THREE-
POINT PROBABILITY DISTRIBUTION
(Thousands of \$)

Year	Expected Cash Flow	Variance of Cash Flow	Expected Profit	Variance in Profit
1	68,978	5.40×10^6	2,140	16,389
2	-466	1.49×10^6	2,853	23,687
3	114	1.76×10^6	3,544	31,157
4	1,222	2.13×10^6	4,427	41,561
5	2,285	2.60×10^6	5,505	60,174

previous year, with the profits of the given year added to this number.

Thus, while the profit of any year is the sum of only 20 distributions, the cash flow is the algebraic sum of as many as 189 distributions. Because the variances are added, even when the means are subtracted, the dispersion of the resulting distribution has the opportunity to be much greater than the dispersion of the distribution for the profit value, even though the underlying probability distributions are assumed to be equal.

Results for Randomly Assigned Three-Point Probability Distributions

As discussed earlier there are 30 separate values requiring a probability distribution for each SBU market share option. Results in Table XI should be compared with those in Tables XII in order to understand the results

of the investigation when the probability distribution associated with each value was chosen at random. The main difference between the two results is the size of the variance of the cash flow distribution. For example, in the fifth year 95.5% of the time the cash flow can be expected to lie in the range $\$889 < \text{cash flow} < \$18,719$. In a similar manner 95.5% of the time the profit should lie in the range $\$10,896 < \text{profit} < \$16,552$, both of which have much larger ranges than found in the case of Table XI.

The difference is very likely because of the dispersion of the distribution assigned to SBU Number 18. As mentioned previously, SBU Number 18 is very large compared with any of the other SBU. And as can be seen from Table XXVII of Appendix D, the distribution which was assigned to it (also Number 18 in the first case) has a variance equal to 0.0096, much smaller than the average of the variances of the entire set. When the distributions were chosen at random, it was thus likely some distributions with larger variances were assigned to some of the values of SBU Number 18, resulting in the differences observed.

Results for a Reduced Set of SBU Options

Table XIII is the result of using the same procedures as those depicted in Table XI, except that SBU Number 18 is assumed to have been liquidated in the first year, with this liquidation producing the large cash flow seen in the first year results. There are substantially lower profits expected from the reduced set of SBU. Thus, 95.5% of the time in the fifth year the cash flow should lie in the range $-\$2,405 < \text{cash flow} < \$6,925$ and

profit in the range $\$5,010 < \text{profit} < \$6,000$. The range of the cash flow overlaps with the range for the cash flows for the other two cases, but this is not true for the likely range of profits.

XI. OTHER RESULTS

A number of other results could be tabulated from the large number of runs performed, and the more important ones are discussed in the following subsections. Each balance sheet could be the subject of an extensive financial analysis, but such a detailed discussion is not warranted.

Comparison of Measurement Criteria

Table XIV compares not only the values of the measurement criteria where they are optimized, but the cases where other measurement criteria are optimized as well. While results shown are for the case where the dividend policy is being investigated, results for the debt to equity ratio policy would be very similar. As pointed out earlier, measurement criteria I, III, and IV resulted in the same optimal set, and the results are not duplicated in Table XIV.

As shown in Table XIV, the results are very similar, even though non optimal values are being compared. In a similar manner as discussed in regard to Table III, an adjustment of the present value of shareholder equity is shown in Table XIV. There was no change in Measurement Criterion V (growth in sales), because over the range of investigation the changes in dividend policy did not result in a restricted optimum.

TABLE XIV
COMPARISON OF MEASUREMENT CRITERIA IN THE
ANALYSIS OF DIVIDEND POLICY

Measure Used for Optimization	Measurement Criteria	Dividend Policy		
		10%	20%	30%
I Present Value of Shareholder Equity	I	167.2	159.4	153.1
	I ² adj ¹	167.2	158.1	149.2
	II	166.8	159.5	153.1
	II adj ¹	166.8	157.8	145.9
	V	166.8	159.2	152.9
	V adj ¹	166.8	157.7	148.9
II Growth in Earnings Per Share	I	64.4	61.2	56.8
	II ²	67.9	64.2	59.7
	V	65.3	61.9	57.5
III Growth in Total Assets	I ²	73.0	65.8	57.9
	II	72.9	65.5	57.6
	V	72.9	65.6	57.8
IV Ending Total Assets	I ²	103.6	98.1	93.3
	II	103.2	97.9	93.1
	V	103.4	98.0	93.3
V Growth in Sales	I	54.2	54.2	54.2
	II	50.2	50.2	50.2
	V ²	55.1	55.1	55.1

¹ Adjusted by removing the effect of equity sales.

² Optimum value.

The observation that the measurement criteria seem to give highly correlated results could be unique to the company being considered, or it generally could be true. There are only a few differences in SBU market share options among the optimum sets of each measurement criterion in Table XXI of Appendix C, and it seems the measurement criteria may produce very similar optimum sets and similar measurement results over a wide range of companies. The result should be investigated further.

The Present Value of Shareholder Equity Divided by the Present Value of Net Assets Employed

One computer run (F1) used as its measurement criterion for optimization the present value of shareholder equity divided by the present value of net assets employed. Table XXI shows that the optimal set under this criterion differs significantly from those of the other five criteria. This conclusion is made based on the type of SBU market share options and the number of different SBU options appearing in the optimal set.

A comparison of results for this measurement criterion with the results for the present value of shareholder equity is contained in Table XV. The comparison seems to indicate there could be a significant opportunity for investigation, as many companies today use some form of return on assets as a measurement factor (5, 15, 21). Table XV demonstrates that equity divided by assets generates more cash over the study horizon, but that it generates only 85% as much profit in the final year. In addition, sales and growth in earnings per share grew more slowly. For the set of measures

TABLE XV

COMPARISON OF KEY OPERATING RESULTS FOR TWO
WIDELY VARYING MEASUREMENT CRITERIA

Measurement Criteria	Present Value of Shareholder Equity ¹	Present Value of Share- holder Equity divided by the Present Value of Net Assets ¹
Present Value of Shareholder Equity (millions of \$)	159.4	154.3
Growth in Earnings Per Share (%) ²	61.2	40.4
Growth in Total Assets (%) ²	65.8	60.5
Ending Total Assets (millions of \$)	98.1	93.2
Growth in Sales (%) ²	54.2	46.8
Sales in Final Year (millions of \$)	114.8	105.3
Debt to Equity Ratio in Final Year (%)	.29	.30
Return on Equity in Final Year (%)	19.6	17.6
Dividends/Share in Final Year	.60	.51
Total Cash Generated (millions of \$)	7.9	9.2
Cash Held as Investment in Final Year (millions of \$)	16.0	17.4
Profit in Final Year (millions of \$)	13.6	11.5

¹ A dividend rate of 20% and a debt to equity limit of 0.6 were used.

² See Appendix I for a definition of growth.

compared in the company investigated, a significantly different company results from the use of the present value of shareholder equity divided by the present value of net assets as a measure of success. This result should be investigated in much more depth and for several other measurement criteria.

The Company-Selected Set of SBU

This subsection compares the results of using the company-selected market share options with an optimal set found for the present value of shareholder equity shown in Table XVI. The company-chosen set (computer Run AO) is discussed in Chapter III. As seen in Table XXI, there is not a large number of differences in the SBU market share options chosen. While the resulting values shown in Table XVI are not very different from optimum, the profit in the last year of the planning horizon is only 89% of the optimum profit. There seems to be a difference significant enough to warrant investigation by the company.

There may be perfectly good operating reasons beyond the ones considered in the model for using the market share options chosen. The optimal solution, however, does show that another set of options could be considered and that it is feasible within the restrictions specified. But the model would be of value even if such an evaluation were its only use.

TABLE XVI

COMPARISON OF KEY OPERATING RESULTS FOR THE
COMPANY SELECTED CASE AND AN OPTIMAL CASE

Measurement ¹ Criteria	Present Value of Shareholder Equity Optimal Case	Company Selected Market Share Options "Base Case"
Present Value of Shareholder Equity (millions of \$)	159.4	156.0
Growth in Earnings Per Share (%) ²	61.2	46.7
Growth in Total Assets (%) ²	65.8	61.8
Ending Total Assets (millions of \$)	98.1	94.7
Growth in Sales (%) ²	54.2	46.3
Sales in Final Year (millions of \$)	114.8	108.9
Debt to Equity Ratio in Final Year	.29	.30
Return on Equity in Final Year (%)	19.6	18.3
Dividends/Share in Final Year	.60	.54
Total Cash Generated (millions of \$)	7.9	9.4
Cash Held as Investment in Final Year (millions of \$)	16.0	17.6
Profit in Final Year (millions of \$)	13.6	12.2

¹ A dividend policy of 20% and a debt to equity limit of 0.6 were used.

² See Appendix I for a definition of growth.

XII. RESULTS WITH RESTRICTED OPTIMA

The operation of the model when a restricted optimum is required uses program ER6 of Appendix B, and this function of the model has been discussed in Chapter II and Appendix A. The operator must decide which SBU market share options are to be changed or liquidated to meet the balance sheet restrictions. Computer runs J9 through J13 of Appendix C exemplify specific cases where it was necessary to obtain a restricted quasi-optimal solution for the conditions being tested. The sequence of events leading to a solution may be followed on the computer run sheets cited.

As indicated in Appendix A, the algorithm for obtaining the optimum requires moving from the unrestricted optimum to the restricted optimum, replacing the one set of SBU options with another set of SBU options which reduce the value of the measurement criterion by the least amount. Although this can probably be done mechanically in order to obtain a mechanical optimum, the model does not encompass all of the factors influencing the measurement criterion. Hence, the mechanical solution is probably not as satisfactory as the operator-selected solution, since judgment in this process is very important. Liquidation generally is necessary and some SBU may be much easier to liquidate in practice than others, and it is therefore important for the operator to be able to designate which SBU are to be liquidated. The number of liquidations involved will be important in a practical application of the model, as it may be easier to liquidate one large SBU than to liquidate several small ones.

Table XVII (from computer run W1) is produced as an aid to the operator in choosing which SBU can be liquidated with the least effect on the measurement criterion. The entries in Table XVII are found by using program PR9 on the intermediate files produced by the first major section of the model (program ER2) for each measurement criterion to be considered. The table shows the amount the criterion will be reduced, for the present value of shareholder equity, if the SBU in question is liquidated from the optimum set of SBU. For example, the first SBU which should be considered for liquidation is Number 10, because it makes the smallest contribution (\$386) to the measurement criterion. Number 3 (\$449) should be second, but only after Number 10 has been restored to the evaluation set. Otherwise, the two would have been liquidated, and the total reduction would be the sum of the two values in question (\$835) -- more than SBU Number 14 (\$566), which should be the next step in order.

In the operation of Run J9 of Appendix C line 2 as an example, the computer prints a number -2621, which is the dollars of equity still to be raised to meet the restrictions. It is possible to develop a computer program to print the amount by which the needed new equity will be reduced if certain SBU market share options in certain years are liquidated, but this was not done as part of the research. If it were, such a list could be used as a guide in conjunction with Table XVII to help the operator make reasonably efficient decisions about liquidation. More work needs to be done to develop such a program and table. However, because it depends

TABLE XVII
THE AMOUNT BY WHICH THE PRESENT
VALUE OF SHAREHOLDER EQUITY
WILL BE REDUCED IF A GIVEN
SBU IS LIQUIDATED

SBU Number	Amount of Reduction (Thousands of \$)	SBU Number	Amount of Reduction (Thousands of \$)
1	4,431	11	2,931
2	1,323	12	2,167
3	449	13	931
4	1,128	14	566
5	3,164	15	2,904
6	5,300	16	667
7	763	17	575
8	1,656	18	39,811
9	867	19	1,598
10	386	20	615

on which measurement criterion is being used, and on which restrictions are in effect, the reduction in required equity can be changed significantly.

XIII. SUMMARY

Each of six policies were analyzed in detail, as were the effect of five measurement criteria, and it was found the five measurement criteria gave very similar results. Some consideration was given to the results of joint effects between two of the policies. The substantially different results obtained using an optimization criterion, with assets in the denominator, was examined, as was the difference between the company-chosen set and an optimal set of SBU market share options.

A limited probability investigation was discussed, providing a probability distribution of profit and of cash flow for a set of SBU being evaluated. Although the model was not programmed to use these distributions to find the optimal solution set and the resulting probable balance sheet, the work is considered to be a valuable base for further research. Finally, the use of the model to find the quasi-optimum set of SBU market share options, when a restricted optimum was required, was explored, and some of possible aids to the operator in finding which market share options to liquidate were mentioned.

The next chapter contains the findings and conclusions of the research, along with suggestions for other investigations. The constraints of the model are discussed, along with some tentative conclusions.

CHAPTER V

SUMMARY AND CONCLUSIONS

I. OVERVIEW

This chapter summarizes the conclusions obtained and mentions the advantages and constraints of the model and the approach. Some points are more conclusive than others, and those which are not conclusive are contained in a section of suppositions. An important subsection of the chapter deals with problems which would seem to warrant further investigation.

The use of the model is explored, as is its value as a device for obtaining insight into the results of managing SBU in selected ways. The value of the several measurement criteria for optimization is highlighted, and the similarity of the results obtained using the criteria is mentioned.

The success of procedures developed in this research for improving the methods of selecting SBU to be included in a company portfolio is commented on. It is suggested that the simulation model should be used in a supporting role to company management, and the policies which seem to be best suited for simulation are indicated.

II. ADVANTAGES AND CONSTRAINTS

This section discusses the advantages and constraints of the model, but the suppositions or tentative results of the research and other investigations of interest are found in the next sections.

Advantages of the Model

The advantages of the model are made most apparent by the uses to which it can be put and its flexibility with a wide range of investigations. Perhaps the most important advantage of the model is to support the planning process by helping gain insight into the future through evaluating alternative scenarios and "playing what if games". Thus it can be used to investigate the effect of changing assumptions about the business environment.

The model is quite flexible, as can be seen from the very wide choice of input data, restrictions, and company specification which can be used. A particularly good use of the model would be in the evaluation of acquisition possibilities. This can be done with relative ease by considering an existing company as one SBU and the acquisition candidate as other SBU. The various market share options can be alternative assumptions about the acquisition candidate. Of course, if funding the new acquisition requires divestiture, the present company would have to be partitioned, though probably not into all of its component SBU.

Another use of the model is to help select the optimum set of SBU

market share options from those available. This is particularly useful when the company resources are not sufficient to fund all of the opportunities presented for consideration. The model is sufficiently flexible to do this for several measures of success, and hence the model can be used either to evaluate a selected set of SBU options or to find an optimal set.

The model is valuable in computing the mean and standard deviation of the distribution of after-tax profit and cash flow which result from a given set of SBU market share options. These are both useful numbers to the planner or decision-maker. With such numbers, actions can be taken to add or delete critical SBU, or to reduce the variation in certain key variables of an SBU, in order to help meet management objectives.

Another good use of the model is to evaluate the effect of such strategic policies as debt to equity ratio, dividend rate, and growth rate, and hence the model is an aid to financial planning.

The model is also a good arithmetical tool because many computations in financial planning can be performed by the model. Although simple in form, these computations are complicated by their large number and the restrictions placed on the final balance sheet. Thus it is useful when a number of outcomes are possible and numerous alternatives are to be evaluated. The model can also be used to evaluate the sensitivity of results to initial conditions or errors in the data, and with its capacity for rapid calculation, many changes can be made and the results computed.

The model should be used in a supporting role. It is mechanistic in

nature, and although it can be used to establish the apparent feasibility of a set of market share options, management must look further and examine other factors before making decisions, because the model cannot possibly consider all of the variables.

Constraints in the Model and Approach

There are a number of constraints or shortcomings in the model, some of which would also be constraints in other modeling efforts. One important constraint is the fact that the model is connected loosely with the outside business environment, and the optima found are less than global. Some of the factors which are ignored, and perhaps should be considered, are stock price, government actions, competitive actions, national laws, and the degree of any labor unrest. Some of these are taken into account when the elemental planning job for each SBU is performed, but the model has no means for taking these into account, once the consolidation of results has taken place. Of course, it is one of the jobs of management to review the output of the model for just such things.

The SBU are assumed to be independent of each other. This generally is not wholly true, but can usually be taken into account, either by combining SBU or by eliminating the effect of intercompany transactions. Further, the contribution of the SBU is assumed to be independent of corporate level expenses, which may not be totally true and must be compensated for by allocating such expenses.

While the flexibility of the model is a definite advantage, it is also

a disadvantage because of the cost and difficulty in obtaining the required volume of input data. The complexity is likewise an advantage and a problem because it makes the model slow to execute, and the training and start-up costs, resulting from complexity, are burdensome. The concept of SBU generally is new in industry, and a certain amount of care must be used to be sure the SBU are properly formed and are not too large or too small. Of course, this problem can be argued to be an advantage, forcing as it does a degree of planning which otherwise might not have taken place.

The choice of computer, and the computer language, could have been better. Although the choices were made for economical reasons, the performance of the model would have been better had the programming been done in the IBM language known as PL-1. Unfortunately, the more generally known language, Fortran, was not available for timesharing software used. The Basic language, although it makes the programs more easily understood, does not have the power for data handling required of such an extensive model, and required a great deal of core storage.

There are some other more detailed problems in the model approach. The model: 1) does not simulate operation within an SBU; 2) except to a limited degree assumes no probability distribution for the input data; 3) assumes the SBU are integer in nature; and 4) does not provide for the balance sheet restrictions or company specifications to vary with time.

The optimization program was accomplished in two phases because of

a shortage of core storage, and this division of the programs caused several false starts. The computer run time was difficult to make acceptable for the restricted optima case, and a great deal of programming effort and time went into making the program operate in the space available.

III. SUPPOSITIONS AND OTHER INVESTIGATIONS

This section discusses some suppositions or tentative conclusions and indicates some of the areas where further investigation would be useful. Most of the suppositions are good areas for further research as well. The next section of this chapter discusses the conclusions which can be reached about the research.

Suppositions

There are a number of results which seem to be true, and there is indicative information which suggests certain others may be true, but which require further investigation. Such findings are contained in this subsection. Perhaps the most important of these is the possibility that return on assets may not be a desirable measure for the long-range success of a corporation. While the information was drawn from an example of only one company, for the company examined it was true.

Another important supposition is that the five measures of success (present value of shareholder equity, growth in earnings per share, etc.) are very highly correlated. Even though the measures gave slightly different

results in the research, the results were very similar for the case studied.

It seems aggressive growth will use more cash in the short run than will a less aggressive approach to growth, but the more aggressive approach will generate more profit and more cash in the long run. There are times when it may be appropriate to increase cash rather than attempt to grow more rapidly, and one of these times may be when an analysis of the risks involved shows that more rapid growth is not justified. Another may occur when it is the known policy of the company to accumulate cash for some purpose such as a hedge against depression, or for use in a possible acquisition.

When the optimal solutions were restricted, and less aggressive, market share options were required, the restricted optimal solution was not appreciably approached until an SBU was liquidated and the cash was entered into the balance sheet. There needs to be more study on the nature of the decision surface for problems of this type. Of course, it is a function of the particular case involved, but it is interesting that the less aggressive options made only small changes in the amount by which restrictions were violated until liquidation took place.

Company management can act independently of the SBU and materially change the success level of the corporation by changing the dividend policy. It seems this is stronger than a supposition, but other supporting work with other companies would help to verify the result.

It appears the debt to equity ratio does not particularly change the

success of the company until the optimum set of market share options are restricted.

The present value of shareholder equity weights the near term results more heavily than long-range results, and as valuable as this measure seems to be, this effect must be considered further to be sure it provides desirable results.

Other Investigations of Interest

The ideas presented in this subsection, along with those in the supposition subsection above, are areas where further research work could be useful.

An important area for further research would be an extension of the probability work started in this dissertation. It would be of particular value to complete the evaluation of a given set of SBU market share options, so that a balance sheet produced for the planning horizon would meet the restrictions at some stated level of confidence.

Perhaps the most important area for further research not already mentioned is the effect on company success of other restrictions on the balance sheet. Among these are price at which equity can be raised, cash as a percentage of short term assets, and short term assets as a multiple of short term liabilities.

Related to the point above is an investigation of the relationship between stock market results, dividend policy and company success. The model is related to the equity and stock market by the assumption that equity

can be raised at a certain value, but this needs further refinement before mechanically obtained restricted optima will be of great value.

The company investigated was cash "rich" and work needs to be done with companies which are cash "poor" (that is where there are many competing SBU options for the small amount of cash available). This may lead to a whole new range of suppositions and insight, for it seems reasonable that the concepts presented in this research are of more value for such cases.

The effect of other factors such as tax rate, currency exchange limitations, and risk of expropriation should be investigated.

There could be more meaningful work done on devising guidelines for aiding the operator of the model in easily and accurately making good choices of SBU to remove from the optimal solution set when obtaining a restricted optimum. The amount of equity which must be raised is known, as is the amount which the balance sheet restrictions will allow. However, the amount of reduction in the unfulfilled requirement, which results from the liquidation of an SBU, is a function of the debt to equity ratio. Dividend rate measurement criteria and other corporate specifications could be computed in tabular form as a helpful aid to the decision-maker.

More useful work can be done on investigating the value of acquiring specific companies; particularly if it can be done with some of the SBU lumped into one "super" SBU to reduce complexity. This "reduced" model would be of value for its efficiency of operation, which in turn could make

it a better tool for planners and decision-makers for this specific purpose.

The effects on company success by the discount factor, cost of capital, and other possible corporate expense such as advertising and research and development are worth further investigation.

Another area for possible investigation is the question of the effect that liquidating one SBU may have on other SBU in the company. They are assumed to be independent, but if adjustments have been made for inter-SBU sales or if corporate expenses have been allocated, the independence assumption is not strictly true. The magnitude of the effects should be understood.

IV. CONCLUSIONS

The principal problem of the research was to find a procedure to aid in the allocation of company resources to large operating segments of the company in such a way as to help satisfactorily achieve company objectives. The author believes the methods examined in this research accomplish that objective.

It is concluded that the methods presented have good potential for significantly increasing the cash generation and the efficiency of the investment process in a company. The procedure seems to be particularly valuable where used in a supporting role. It should be noted that, at best, simulation and modeling only are supportive to decision-makers and should never take on a decision-making role, because there are many factors

(human and other) outside the assumptions of the model.

The present value of shareholder equity is a useful measurement criteria, although, as mentioned previously, more research needs to be done to be sure the measure does not have unfavorable side effects. It seems there may be a high degree of correlation between the five measures investigated, and all gave a similar optimal set. However, it seems several of the measures should be used together to aid in decision-making, focusing as they do on different aspects of the problem.

The model is very flexible and can be used for a number of purposes, such as to evaluate a given set of SBU options or to find the optimum set of options for specified measurement criteria. It can be used in an interactive mode as an aid to decision-making, and is valuable for evaluating alternatives, performing arithmetical calculations, and as an aid in finding feasible SBU option sets.

It is concluded that the dividend policy has a strong effect on the rate at which a company can grow. The debt to equity ratio policy has its major influence when a restricted optimum is required, and when such is the case, it has a significant effect on which SBU options are included in the optimum set.

The use of pricing to obtain market share indicates more aggressive options will generate more sales, use more cash in the short run, and make more profit. However, the higher risk associated with them may or may not be acceptable. Essentially, the same results are noted from an investigation of the policy of managing for growth stability, or liquidation except

that the less aggressive approaches accept a lower market share and profit in order to generate cash.

For the purpose of acquisition, it appears SBU with specific characteristics can be acquired to best meet the measurement criteria. The degree to which this is satisfied depends on the options available when the input data for the SBU are formulated.

The simulation model is a valuable tool for examining the effect of those strategic policies which can be quantified.

There are ranges of complexity where the procedures of this research are most applicable, as well as some very definite limitations. The first obvious limitation is the size, speed, and cost of the available computer hardware. For the computer and language used in this research, twenty SBU with three market share options each are a practical limit, and perhaps fifty such SBU are a practical limit for the largest interactive programs. In any case, the limit on management's ability to orchestrate a much larger set of SBU is questioned, although such corporate giants as ITT may be exceptions to the rule. Likewise, there is a lower limit on the number of SBU; even though the method is completely valid, the complexity is not sufficient to warrant the effort if there are too few SBU involved. Perhaps such a lower limit is approximately six SBU (a number which was chosen quite arbitrarily as a matter of the author's judgment).

A further conclusion is the SBU are good decision variables. It may be possible to develop a very similar methodology as used in this research for other corporate structures, but the concept of SBU seems to present the

variables in a way which can be useful for analysis and decision-making. In any case, if a company is not involved in this type of modeling, perhaps it should be; it seems to greatly enhance the ability to choose good combinations of SBU market share options.

V. SUMMARY

The strengths, constraints, suppositions, recommended investigations and conclusions which represent the results of this research were presented in this chapter. The work has been found useful by the author, and it is his belief the techniques presented here are a useful addition to knowledge of how the planning process in large corporations can be enhanced. The methodology presented here is but one tool, but it seems to be a powerful analytical device for evaluating alternatives and selecting those options which best meet company objectives.

A SELECTED BIBLIOGRAPHY

I. BOOKS

1. Ackoff, R.L.; A Concept of Corporate Planning; Wiley-Interscience: New York, 1970.
2. Ansoff, R.U.; Corporate Strategy, McGraw-Hill: New York, 1965.
3. Ayres, R.U.; Technological Forecasting and Long Range Planning, McGraw-Hill: New York, 1969.
4. Bogen, J.I., Shipman, S.S. (editors); Financial Handbook; The Ronald Group, Boston, Mass., 1968.
5. Boston Consulting Group; Prospectives on Growth, Boston Consulting Group, Boston, Mass., 1968.
6. Boston Consulting Group; Prospectives on Corporate Strategy, Boston Consulting Group, Boston, Mass., 1968.
7. Cannon, J.T.; Business Strategy and Policy; Harcourt, Brace & World, Inc., New York, 1968.
8. Feller, W.; An Introduction to Probability Theory and its Applications, Volume I; John Wiley & Sons, New York, 1950.
9. Hunt, P., Williams, C.M., Donaldson, G.; Basic Business Finance, Richard & Irwin, Inc., Homewood, Illinois, 1965.
10. International Business Machines Corporation; IBM System/360 OS/DOS ITF; Basic Terminal Users Guide; International Business Machines, Inc., New York, 1970.
11. Markowitz, H.; Portfolio Selection: Efficient Diversification of Investments, John Wiley & Son, Inc., New York, 1959.
12. Meier, R.C., Newell, W.T., Pazer, H.L.; Simulation in Business and Economics, Prentice-Hall, Englewood Cliffs, New Jersey, 1969.

13. Naylor, T.H.; Balintfy, J.L.; Burdick, D.S., and Chu, K; Computer Simulation Techniques, John Wiley & Son, Inc., New York, 1968.
14. Schreiber, A.N., Editor; Corporate Simulation Models, University of Washington Press, Seattle, Washington, 1970.
15. Steiner, G.A.; Top Management Planning, MacMillan Co., London, 1969.
16. Troy, Leo; Manual of Performance Ratios for Business Analysis and Profit Evaluation; Prentice-Hall, Inc., Englewood Cliffs, New Hersey, 1966.
17. Wagner, H.; Principles of Operation Research, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1969.

II. HARVARD BUSINESS REVIEW

18. Christopher; Marketing Planning that Gets Things Done. Sep.- Oct., 1970 (PP 56-64).
19. Hillman; How to Redeploy Assets. Nov. - Dec., 1971 (PP 95-103).
20. Kotler; Corporate Models: Better Marketing Plans. Jul. - Aug., 1970 (PP 135-149).
21. Welter; Put Policy First in DCF Analysis. Jan. - Feb., 1970. (PP 141-148).
22. Wittnekert; Bigness versus Profitability. Jan. - Feb., 1970. (PP 158-166).

III. MANAGEMENT SCIENCE JOURNAL

23. Agnew, et al; Chance Constrained Programming to Portfolio Section. June 1969 (PP 512-520).
24. Bierman and Hausman; The Resolution of Investment Uncertainty through Time. August 1972 (PP 654-662).
25. Chen, Jen, Zionts; Portfolio Models with Stochastic Cash Demands. November 1972 (PP 319-332).

26. Eppen & Fama; Three Asset Cash Balance and Dynamic Portfolio Problems. January 1971 (PP 311-319).
27. Fama; Portfolio Analysis in a Stable Paretian Market, January 1965 (PP 404-419).
28. Hastie; The Determination of Optimal Investment Policy, August 1967 (PP 757-774).
29. Krause; A Model for Aggregate Financial Planning. June 1972 (PP 555-566).
30. Levy; Portfolio Performance and the Investment Horizon. August 1972 (PP 645-653).
31. Pyle and Turnousky; Risk Aversion in Chance Constrained Portfolio Selection. November 1971 (PP 218-225).
32. Sharpe; A Linear Programming Algorithm for Mutual Fund Portfolio Selection. March 1967 (PP 499-510).
33. Sharpe; Mean - Absolute - Deviation Characteristic Lines for Securities and Portfolios. October 1971 (PP 1-13).

IV. BOSTON CONSULTING GROUP PAMPHLETS AND WORKING PAPERS

34. Critical Strategy Decisions; August 1969.
35. Experience Curves as a Planning Tool (IEEE Spectrum, June 1970).
36. Growth and Financial Strategies, 1968.
37. The Impact of Strategic Planning on Executive Behavior, 1968.
38. Strategy Formulation and Evaluation; A Rigorous Approach, 1970.

V. OTHER SOURCES

39. Fortune Magazine; "The Fortune 500", Volume LXXXIX No.5, Time, Inc., New York, 1974.
40. Management Accounting; "Section 931 and the Puerto Rican Program", Vol. LV, No.9, March 1974, The National Association of Accountants, New York, 1974.

APPENDIX A

SUPPLEMENTARY MATERIAL TO CHAPTER II

I. OVERVIEW

This appendix contains material which augments the research material found in Chapter II, and it should be read by anyone who is interested in gaining a better understanding of the details of the simulation model. There are three major sections in this appendix, the first describes the input detail and data collection forms, the second discusses the balance sheet restrictions during simulation, and the third discusses the measurement criteria and the development of the optimization algorithm for each of the five measures used in the research. The material found here is best read in conjunction with the discussion in Chapter II.

II. INPUT DATA

The discussion which follows is organized around each of the five data input sheets which are required to specify a corporation composed of a number of SBU. Many of the items on the data sheets are self-explanatory and are not mentioned; however, some are not and these are described in more detail. Throughout the discussion, item number refers to the line number on the figure under discussion.

SBU Profit and Loss Statement

Figure 9 (SBU Profit and Loss Statement) must be completed for each SBU market share option under investigation. Thus, in the case of the research reported, there were three market share options for each SBU and twenty SBU; the length of the study horizon was five years, and therefore, there were 150 data sheets to be completed. In abbreviated studies some of the items may not be needed, and if so the data collection phase can be somewhat simplified. While most of the data entries are standard business items and need no explanation, a few should be explained.

Item 9, equivalent fraction of contribution which is fully taxed, is used to account for the significant cash flows which occur when an SBU has tax-sheltered income. This can occur, for example, when income is derived from a Section 931 company, which has special tax treatment under the law (40). (It should be noted tax losses carried forward, or tax-sheltered income derived from certain types of corporate investments, should be accounted for in the data sheet of Figure 10.) Thus, if none of the contribution is tax sheltered, 1.0 is entered (100%), but if some tax-sheltered income is included, the fraction of line 8 which would be equivalent to no tax-sheltered income, is entered. For example, if line 8 equals \$1 million and includes \$100,000 which is taxed at one-half of the corporate rate, 0.95 should be entered.

Line 10, SBU market share at year end, and line 13, market share strategy, are used together. Line 10 is simply management's best guess for the percent of market obtained by the SBU using the strategy recorded

<u>Line #</u>	<u>Description</u>	
1	Net Sales	_____
2	Cost of Sales	_____
3	Gross Margin	_____
4	Selling Expense	_____
5	Engineering Expense	_____
6	Administrative Expense	_____
7	Other Income (Expense)	_____
8	SBU Contribution	_____
9	Equivalent fraction of contribution which is fully taxed	_____
10	SBU market share at year end	_____
11	SBU #	_____
12	End of Year #	_____
13	Market Share Strategy (1, 2 or 3)	_____
14	Blank	_____
15	End of Record Signal 999, 777, 555, or 0	_____

Figure 9. Data input sheet SBU profit and loss statement
(in thousands of dollars).

in this input sheet and labeled as 1, 2, or 3 in Item 13. Conceptually, any number of strategies can be employed, but for practical purposes the study in this paper is limited to three. The data designated on the input sheet should be management's best estimate of the SBU results expected from the market share stated in Item 10 and labeled in Item 13. Item 14 is left blank for space for expansion if other factors are discovered which should be carried through the simulation. Item 15 is a data processing convenience to label the record as to end of file 999, end of year 555, end of SBU within the year 777, or otherwise zero.

SBU Assets and Liabilities

Figure 11 records the assets associated with each SBU market share option for each year and corresponds to the data described in Figure 9. Because of differences in use during computer processing, the data are contained in different files, but conceptually they need not have been. Again, much of the data is usual accounting information and needs no particular explanation.

Items 6, 7, 8, and 9 are supplied by the computer and are the result of simple formulas. Item 6, total assets employed, is defined as the sum of inventory plus receivables plus plant and equipment. (Line 1+2+3). This definition is arbitrary and other combinations of assets could be used. Item 7, total net assets employed, is Item 6 less accumulated depreciation Line 4. Item 8 is another measure of assets employed which is computed by subtracting payables Item 5 from Item 7.

<u>Line #</u>	<u>Description</u>	
1	Total SBU Contribution	Computer supplied
2	Corporate Income (or expense)	<u>(excluding investment of surplus cash)</u>
3	Interest to Service Debt	Computer supplied
4	Tax	Computer supplied
5	Net Profit after Tax	Computer supplied
6	Tax Rate on Fully Taxed Income	<u>(fraction)</u>
7	Equivalent Fully Taxed Income from SBU	Computer supplied
8	Interest Income from Investment Pre-tax	Computer supplied
9	Equivalent Fully Taxed Income	Computer supplied
10	End of Year #	<u></u>

Figure 10. Data input sheet abbreviated corporation profit and loss statement (in thousands of dollars).

Item 9 is the after tax liquidation value of the company, at the end of the year designated, if the SBU is company owned, and it is set equal to zero if it is not company owned; however, in the simulation it was arbitrarily set equal to Item 8, but other values could have been used.

Item 13 is identical to that in Figure 9 and connects the data in Figure 9 and Figure 11. For data processing convenience and to keep the record size exactly equal to 15, Item 10 and 14 are blank. They do, however,

<u>Line #</u>	<u>Description</u>	
1	Average Inventory	_____
2	Average Receivables	_____
3	Average Plant, Equipment and Land	_____
4	Accumulated Depreciation for Line 3	_____
5	Average Payables	_____
6	Total Assets Employed	Computer calcu- lated, need not <u>be supplied</u>
7	Total Net Assets Employed	_____ "
8	Total Net Assets Employed after Payables	_____ "
9	After Tax Liquidation value of the SBU (if currently owned by corporation, otherwise zero)	_____ "
10	Blank	_____
11	SBU #	_____
12	End of Year #	_____
13	Market Share Strategy (1, 2 or 3)	_____
14	Blank	_____
15	End of Record Signal (999, 777, 555, or 0)	_____

Figure 11. Data input sheet SBU assets and liabilities
(in thousands of dollars).

allow for other data items if any are found necessary.

It must be noted that all inter SBU profit must be eliminated before entering data on forms of Figure 9 and 11.

Abbreviated Corporation Profit and Loss Statement

Figure 10 records the corporation profit and loss information; however, all but two lines are calculated by the computer from information supplied in Figures 9 and 11. Line 2 is the corporate income (negative if expense) which is derived from sources other than SBU. This type of entry occurs from corporate headquarter operations, royalty income, and other miscellaneous income or expense which is strictly related to corporate management. Income from the investment of surplus cash, however, is handled separately by the computer within the simulation and should not be entered here. Line 6 is the corporate tax rate on fully taxed income. In the United States this tax rate is 50%, but it may vary from state to state depending on local taxes, and it is required for each year in the planning horizon.

The formulas for the calculation of the computer supplied numbers are simple financial relations which lead to the after tax income of the corporation, Line 5.

Corporate Balance Sheet

Figure 12 provides the beginning balance sheet entries for the simulation, and this base data, along with the projected operating results

Beginning of Year I

<u>Line #</u>	<u>Assets</u>	<u>Line #</u>	<u>Liabilities</u>
1	Cash _____	7	Payables _____
2	Inventories _____	8	Short Term Debt _____
3	Receivables _____	9	Long Term Debt _____
4	Investments _____	10	Shareholder Equity _____
5	Plant, Equipment and Land _____		
6	Accumulated Depreciation _____		
11	Total Assets _____	12	Total Liabilities _____
13	Shares of common stock outstanding _____		
14	Dividend declared on beginning number of shares (total \$)		<u>Computer Supplied</u>
15	Dividends per share		<u>Computer Supplied</u>

Figure 12. Data input sheet corporate balance sheet
(in thousands of dollars).

already discussed, is used to compute the future balance sheets which are key to the simulation. Lines 11 and 12, total assets and total liabilities respectively, must be equal by definition and lines 14 and 15 are computer supplied. Unlike the other input data sheets discussed, this form is required only once and need not be supplied for each succeeding year of the planning horizon.

The calculation of succeeding years of the balance sheet is described in the section on The Balance Sheet During Simulation, as found in this appendix.

Corporate Operating Criteria

Figure 13 is used to record corporate operating criteria which serve to limit the size of some of the balance sheet items in the simulation as well as establish a base for some of the strategic questions raised. Most of the factors are self-explanatory and are well defined in financial literature. However, a few require explanation.

Line 1, the discount factor, as established by management as the pre-tax value of the cost of capital to the firm. There are a number of articles relating to the definitions of this term (9), and it seems it can have a wide range of possible values. It is at least equal to the bank rate for borrowing money, but it is probably higher because excessive borrowing can "weaken" the balance sheet and increase the interest cost at which further borrowing can be done. If a company is making a specific pre-tax profit on its present assets, and wants to maintain this value as a minimum, then the value of the discount factor should be at least equal to this profit rate. Its effect on the simulation results could be investigated and would be an interesting undertaking. However, for the purpose of this research it was set at 15%.

Line 2 is the rule for declaring dividends. This, of course, is only an approximation to reality for dividends, as declared by most boards of directors, seem to take into account other factors besides earnings;

<u>Line #</u>	<u>Description</u>	
1	Discount factor s (Management established value equal to the pre-tax cost of capital to the firm)	_____
2	Dividends as a fraction of net profit after tax	_____
3	Maximum debt to equity ratio	_____
4	Minimum current ratio (must be greater than 1)	_____
5	Minimum cash as a fraction of other beginning current assets	_____
6	Effective interest rate pre-tax on long and short term debt	_____
7	Return on corporate investments pre-tax	_____
8	Maximum acceptable dilution from equity sales (as a fraction of the current year's earnings/share)	_____
9	Number of times old earnings/share for which new equity can be raised	_____
10	Blank	_____

Figure 13. Data input sheet corporate specifications.

however, such a dividend rate is quite adequate to investigate the effect of changes in the dividend policy.

Line 8, the maximum acceptable dilution from equity sales, limits the amount of new equity that can be raised by selling stock. It is a management judgment factor, but is required to restrict the balance sheet during

simulation. Line 9, the number of times last year's earnings per share for which new equity can be raised, is a semi-automatic way of entering the sale price of a new issue of company stock. It has the same basis in practice however, as "earnings per share multiples" and is one way of judging probable stock selling prices, thus restricting the simulation.

It is assumed the specifications established in Figure 13 hold for the entire planning horizon, and as a result only one input form is required. It was judged to be unnecessary to make the data vary with time, although they could, of course, be assumed to have a different value for each year in the planning horizon. The data processing program could have been made with this flexibility. It was arbitrarily decided not to do so because of lack of information on how to meaningfully set such parameters, further complicated by the computing complexities it would have introduced.

III. BALANCE SHEET DURING SIMULATION

This section describes the restrictions imposed on the balance sheet during simulation as well as how some of the restrictions result in new balance sheet values.

During the simulation cash in Figure 12, line 1 is adjusted to make assets balance liabilities. If the number is negative, investments line 4, Figure 12, will be liquidated. Or if insufficient investments are available, the debt or equity section will be increased to bring the cash value to an acceptable level as a fraction of other current assets if possible. Cash in

excess of a certain level is assumed to be invested at a specified rate of return at line 4, Figure 12, or by an alternate criterion to pay off debt, if any.

Debt line 8 and 9, Figure 12, either short or long term is assumed to be equal to the previous year's value until after cash on line 1, Figure 12, is computed and investments liquidated; Then the short term debt (or as seen later, possibly long term debt or equity) is increased as above, to bring the cash level to a specified fraction of other current assets.

The amount of short term debt (Line 8, Figure 12) depends upon the smallest allowable current ratio as specified on Line 4 of Figure 13. The remainder of debt required to meet the above criteria is long term debt (line 9, Figure 12). If in the meantime the debt to equity ratio exceeds line 3 of Figure 13, more equity is required, instead of increased debt, to raise cash to meet the above restrictions.

Shareholder equity line 10, Figure 12, equals beginning equity plus after tax profit line 5, Figure 10, minus dividends resulting from the calculation required by line 2, Figure 13, plus equity sales, if any, resulting from the restriction on the debt to equity ratio. The dilution from equity sales is limited as a fraction of the current year's earnings per share by a management established criteria at line 8, Figure 13. The value of such equity sales is established at line 9, Figure 13. If the restrictions on equity sales cannot be met, a restricted optimal solution is required, and the techniques described in the section on restricted optimal solutions

must be employed.

The other balance sheet accounts are computed from input data and, as such, influence the extent to which the boundaries established by restrictions listed above are encountered.

The computation of the other balance sheet lines is as follows in Figure 12. Inventory line 2 of Figure 12 is the result of summing over all line 1's of Figure 11, for the year in question for the SBU market share assumptions being evaluated. Accounts receivable line 3 of Figure 12 is the result of summing over all line 2's of Figure 11, for the year in question for the SBU market share assumptions being evaluated.

Investment line 4 is computed as the result of a beginning value from the previous years balance sheet and is added to, or subtracted from, as required by the restrictions noted above. Plant, Equipment and Land line 5 is line 3, Figure 11, for the year in question and is summed over the SBU market share assumptions being evaluated. Depreciation line 6 is line 4, Figure 11, and is summed in the same manner. Payables line 7 is line 5, Figure 11, and is summed in the same manner. For precise and detailed formulation of these calculations and restrictions refer to the computer program in Appendix B.

IV. THE MEASUREMENT CRITERIA AND OPTIMIZATION

This section discusses the more technical aspects of each of the measurement criteria used in the research. The principal algorithm for obtaining the solution to the integer programming problem is presented

under Case I and is referenced when the other four cases are discussed.

Case I - Present Value of Shareholder Equity

The mathematical expression for the objective function is described as follows:

Given

- k different SBU
- m market share strategies for each SBU
- n years in the study horizon
- s cost of capital factor chosen by management line 1, Figure 13
- C_j after tax profit of the corporation in year j, Figure 10, line 5
- E_0 beginning shareholder equity from Figure 12, line 10.

Maximize the present value of shareholder equity (F):

$$F = E_0 + (1 + s)^{-n} L_n + \sum_{j=1}^n (1 + s)^{-j} (C_j - D_j + E_j)$$

Where

- L_n liquidation value of SBU at end of the final year in the study
- E_j equity sales in year j
- D_j dividends paid in year j, and the SBU embodied in C_j are the variables to be determined

Subject to the constraints discussed in the previous section.

There are two difficult problems presented by this set of equations.

First, the contribution of the corporation C_j is not only a function of SBU contribution, but is also a function of the cash available for investment by

the corporation in the past time period. The second is the integer nature of the problem introduced by the fact an SBU is either included or not included in the evaluation set.

This system of equations is linear and the problem could probably be formulated as a linear integer programming problem, but the size of the problem would be too large for the interactive mode of the computer used in this research, and the amount of computer time involved even if the problem could be formulated, is probably excessive.

For the above reasons, the nature of the problem was examined and a method of finding a quasi-optimum was discovered, which seems to be satisfactory for most cases. In practical problems, any set of the SBU being considered will frequently be a feasible solution because the company is operating and totally unreasonable sets would not be considered. Thus a method was devised for ordering the set of SBU and their market share strategies into a sequence which contributes the most to the present value of the shareholder equity. The methodology for the other optimization criteria follow a similar technique and are discussed in succeeding sub sections.

To develop a measure of success, it is necessary to determine, for each market share option for each SBU, the measure of value (R) of that option to the corporation as measured by the present value of shareholder equity. This measure of value is the present value of the after tax contribution of the SBU, reduced by an appropriate share of corporate expense,

plus the present value of the liquidation value of the option after the last year of the planning horizon. In formula from this measure is for each SBU option:

$$R = S + L$$

Where

L = The present value of the liquidation value in the final year

S = The present value, over the planning horizon, of the sum of the after tax contribution of the SBU reduced by an appropriate share of the corporate expense.

It is useful to assume that the measure of the appropriate share of the corporate expense is added in the same ratio as the present value of the SBU after tax contribution, plus liquidation value, is to the total contribution of the company. If this is done, the order of the R's one to another is not changed by the addition of this factor. This is easily demonstrated as follows: Given an ordered set of factors

$$a_1 > a_2 > a_3 \dots a_k \text{ in which a factor equal to } ca_1/\sum a_i = ba_1 \text{ is added to each } a_i.$$

The set becomes

$$a_1 + a_1b ; a_2 + a_2b ; \dots$$

Which can be restated as

$$a_1 (1 + b) ; a_2 (1 + b) ; \dots$$

This is equivalent to multiplying the original inequality formula by $(1 + b)$; the order is unchanged by the addition of the factor in question, and as far as ordering is concerned, the corporate income (expense) may be ignored.

This assumption seems to be a valid way of assuming how corporate expenses should be allocated. It is also intuitively pleasing that the importance of each SBU to the corporation is independent of the corporate expenses incurred. This, of course, may not be true, but it is assumed to be true in this work, and it should be noted that it can be made to be true by assigning all of the expenses appropriate to an SBU to that SBU in the input data.

Once the order of importance R is computed, the method of finding the set of SBU, and their market share options which maximize the present value of shareholder equity, proceeds as follows. The algorithm starts by evaluating the set of SBU options which have the largest R factor, and if it is found this set violates the constraints, then a new set to be evaluated is found which varies from the first by the smallest amount the data allows. The new set is composed of the options which reduce the sum of the R 's in the evaluation set by the least amount. Thus:

1. Compute R for each SBU market share option in the entire set of possible combinations. If there are k SBU and m market share options then there will be k times m ratios.
2. Sort the R 's into descending order for each SBU.
3. For each SBU, k , compute the positive differences D_k of the largest R_{k_1} , minus the next largest R_{k_2} until all m differences are found. For the smallest R_{k_m} the difference is simply R_{k_m} - zero = R_{k_m} .

4. Use the model to evaluate the set of SBU market share options having the largest R . (Recall only one market share option for each SBU)
5. If the restraints are not violated, this set of SBU options is optimal and the algorithm is finished.
6. If the restraints are violated, remove the market share option having the smallest difference D_k in the set just evaluated, and replace it with the market share option whose R is the next smallest for that same SBU. It may be that the option with the smallest R in any SBU may be removed. This means the SBU is to be liquidated. After the first iteration, it is necessary to find which market share option or options to remove by eliminating that set which has the next largest sum of $D_{k's}$ exceeding the sum of $D_{k's}$ removed at the preceding step. Only those $D_{k's}$ which have been previously eliminated, or are next lowest in rank in the SBU line to those which have been eliminated at some time, are eligible for consideration for elimination. But within an SBU, before a D_k is eligible for elimination, all prior D_k in that row must be included in the sum being computed.
7. Repeat Step 4 - the algorithm is complete when the first feasible set is found at Step 5.

This algorithm is not the same as a complete evaluation of all possible

SBU options, because it stops as soon as the largest feasible solution is found. If the maximum set is very near to being a feasible set, the algorithm is quite efficient. If not, it is still accurate, but it is less efficient.

Although the algorithm is judged to be accurate, it was determined a quasi-optimal procedure would be used at step 6 for two reasons. The first is a significant amount of computer time is required to find the entering set of market share options, and the second is the mechanical optimum does not necessarily suit the needs of the decision-maker using the model. Therefore, it was decided to let the decision-maker choose which SBU option to change in an interactive mode with the computer and by using his own skill to reach a satisfactory or quasi-optimum solution.

As an aid to help accomplish the decision-maker's task, the computer was programmed to provide the amount the unrestrained optimum solution requires in new equity to meet the restraints. In addition, the amount the elimination of each SBU option decreases the magnitude of the optimization criterion is also computed. Thus, the decision-maker has some mechanical data at his disposal, as well as his knowledge about special situations in each SBU, to help him reach a "satisficing" optimum.

Case II - Growth in Earnings Per Share

The next objective function for which an algorithm must be found is growth in earnings per share. There are several ways to define growth, but quite arbitrarily and for the convenience and ease of programming, it was chosen to define growth as the after tax earnings in the last year of

the planning period minus those in the first year. This method has recognized shortcomings, but changing to other methods introduces operational rather than conceptual complexities into the program, and since the merits of any one method may be debated against another, this method was chosen.

The objective function to be maximized is given as:

$$F = P_n - P_1$$

Where P_n equals the after tax profit of the corporation in the last year of the planning horizon, and P_1 equals the after tax profit of the corporation in the first year of the planning horizon. The formula is subject to the same balance sheet restrictions as used in Case 1. The variables to be determined are the SBU market share options which are contained in the profit variables. It is further assumed the criterion is the growth in earnings per share on the beginning number of shares. This assumption allows the objective function to contain only profit and not the profit per share.

The solution to this problem is of the same nature as discussed for the present value of shareholder equity and can proceed in a nearly parallel manner.

It is assumed any SBU option present at the end of the planning horizon was also present at the beginning of the planning period (no matter how small) and vice versa. This is an operational requirement and not a restriction on liquidating or acquiring SBU, but it does require that such actions are planned. The model does not automatically make these decisions.

The solution parallels Case I as follows: After a suitable assumption about corporate expense or profit to make the ranking of the decision variables independent of this factor, define a measure of value for each SBU option as $R = S_n - S_1$. Where S_n is the after tax profit, of the SBU option in question for the last year of the planning horizon, found by applying the corporate tax rate to the calculated, fully taxed equivalent of the SBU's pretax income available from line 8 and line 9 of Figure 9. In a like manner, S_1 is the corresponding value for the first year of the planning horizon. Once the R factors have been computed, the solution to the optimization problem uses the same algorithm as Case I.

Case III - Growth in Total Assets

The next case to be discussed is growth in total assets. As with the other cases, the approach is to find how much an SBU market share option contributes to the objective function and to use the maximization algorithm in exactly the same way as before. The same point to point definition of growth is used as in Case II--namely, that the total assets at the end of the planning period minus the corresponding value at the beginning is a maximum. Thus, maximize, $F = B_n - B_0$; where B_n is the total assets of the corporation at the end of the last year of the planning period, B_0 is the corresponding value at the beginning of the planning period, and subject to the same balance sheet constraints as the previous cases. The variables to be determined are also the same as the previous cases, but this case is somewhat more involved than the previous one because the SBU assets

and liabilities sheet, Figure 11, does not carry a cash account. Only the corporate balance sheet, Figure 12, and the simulation output derived as the evaluation proceeds, contains cash and investments. For the purpose of the discussion here, cash and investments can be considered to be the same without loss of generality.)

It is necessary to determine the contribution of the SBU option to the corporation's total assets before it is possible to calculate an R factor and proceed with the solution by the algorithm of Case I. To do this, consider that all balance sheet asset accounts, except cash and investments, are simply the sum of the corresponding SBU accounts. Cash and investments are the consequence of balancing the liabilities side of the ledger, but the only contribution SBU make to liabilities is after tax profits and payables. Thus, total asset growth will be largest when the corporation is composed of those SBU options which have the largest net assets plus payables growth combined with total contribution over all years of the planning period.

Before defining the R function, a choice must be made as to whether total assets should be defined as before or after depreciation, and it was arbitrarily determined assets after depreciation would be used. This figure corresponds to the total asset line on the balance sheet; however, gross assets (that is, neglecting depreciation) could be chosen just as easily with probably somewhat different results. It is a problem because depreciation is frequently computed for tax purposes and, for this and perhaps other reasons, net assets may or may not reflect the true value of

the fixed assets involved.

The measure of value R of each SBU is given by:

$$R = A_n - A_1 + p_n - p_1 + \sum_{j=1}^n S_j$$

where $A_n - A_1$ is the difference between ending and beginning net assets for the SBU option, $p_n - p_1$ is the difference between ending and beginning payables for the SBU option, and $\sum_{j=1}^n S_j$ is the after tax profit of the SBU option over all years of the planning period.

Other factors can affect total assets; these are ignored as being outside the influence of the SBU options which are the decision variables. Such things as dividend policy and debt to equity ratio policy can greatly change the size of the total assets, but they are strategic decisions and cannot be controlled by the managers of the SBU. Once the R factors have been computed, the solution of the maximization problem utilizes the algorithm of Case I in the same manner.

Case IV - Total Assets

This case is very similar in structure to that of the growth of total assets (Case III). The R factor simply ignores the beginning value of the balance sheet A_1 and p_1 . Thus for this case:

$$R = A_n + p_n + \sum_{j=1}^n S_j$$

where the variables have the same definition as in Case III, and the solution proceeds in the same manner.

Case V - Growth in Sales

The last case to be considered is for growth in sales. This is conceptually the easiest case and the problem is simply stated as maximize:

$$F = T_n - T_1$$

where T_n and T_1 are total corporation sales in the last year and first year of the planning horizon respectively. The R factor is $R = t_n - t_1$ where $t_n - t_1$ is the growth in sales for each SBU option as the difference between last and first year sales. These are computed from the input given on line 1 of Figure 9 and the algorithm of Case I is used in the same way as in the previous cases.

APPENDIX B

COMPUTER PROGRAMS

I. LIST OF PROGRAMS FOUND IN APPENDIX B

<u>Program Name</u>	<u>Page</u>
Program ER2	146
Program ER6	150
Program ERP	155
Program PR3	158
Program PR4	159
Program PR6	159
Program PR9	160

II. DISCUSSION

This appendix contains the program listings of each of the operational programs used in the model, along with a short synopsis of each program. One of the great advantages of the Basic language in which the programs are written is that the code is easy to learn and read. Anyone who is familiar with the language can understand a program with minimal effort.

There are seven principal computer programs listed; however, a number of auxilliary runs, which are used to obtain special output or in-

frequently required results along with standard file handling routines, are not shown.

Program ER2

Program ER2 is the first of two major programs in the model and is used to initialize files and compute intermediate results. If an optimum solution is to be obtained, the program computes the amount which each SBU market share option contributes to the measure being optimized; sorts the SBU market share options into decreasing order of contribution to the measure; stores the results as intermediate files; and selects the SBU market share options which give the unrestricted optimum. On the other hand, if only an evaluation of a set of SBU market share options is to be obtained, rather than an optimal set computed, the program summarizes the input data files to obtain SBU profit and loss and asset and liability values as intermediate results for the next program.

Each of the five measurement criteria discussed in Appendix A can be programmed for inclusion in Program ER2; although the case shown in the listing of this appendix is the present value of shareholder equity. The other measures require minor changes to the program where the contribution to the measurement criterion is computed for each SBU market share option. See Figure 4 for flow chart of Program ER2.

Program ER6

Refer to Figure 5 for flow chart of program ER6 which is the second

major program in the model. This program uses the intermediate results stored by Program ER2 to compute the final outputs of the model. If the model is performing an evaluation of a given set of SBU market share options, the program uses the initial values of the corporate balance sheet Figure 12 and applies the restrictions imposed by the program. In which case it is assumed that the ultimate restrictions, on the amount of new equity which can be raised, can be met. If the restrictions cannot be met, the computer continues after reporting the fact.

If the program is computing an optimum, and the restrictions are not violated, the program continues as above. If the restrictions cannot be met, the program requests the operator to selectively change the SBU market share options, and the program will try again. This cyclic sequence will be continued until the restrictions are met and the program can compute all of the desired output. For a typical interactive sequence of this type, see computer output J12 (second) of Appendix C where the computer found at the end of year 1 (CPL Comp 1) that \$479.4258 more new equity was needed than could be raised. The computer requested the operator to input a new K and V(K). (SBU number and market share option respectively.) SBU 16 was liquidated ($V(16)=0$), and the program printed out the total equity required was \$5,122,398 (479.4258 more than could be raised). It then completed the first year and found with the new set there was \$253,3672 still needed in equity beyond what the restrictions would allow. The interactive sequence is seen to continue until the final year is satisfactorily completed (the fifth year in the case shown - CPL Comp 5).

Program ERP

Program ERP uses the output of Program ER2 to obtain the probability results indicated in computer output P1 through P4 found in Appendix C. Twenty arbitrary probability distributions are found in the DATA section of the program and can be quite easily changed at the discretion of the operator. The format of the computer output also is found in Appendix C and consists of the mean and variance of the distribution of each asset account being considered, the payable value, the after tax profit value; and where appropriate the liquidation value of SBU being liquidated.

Program PR3

Program PR3 is one of a series of four programs used to print results from the model and is used to list the balance sheet for each year of the planning horizon from an output file created by Program ER6. As explained in Chapter II the model is so large the programs cannot all be in working memory at the same time with the particular subset of the Basic language which was used, and therefore it was necessary to segment the model. The format for reading the balance sheet printout (for example the first page of Computer run AO) is given by Figure 14 of Appendix C.

The program also prints a number of self explanatory statistics (for example see the second page of computer run AO) some of which are single values referring to the entire planning period while others are for each year of the planning horizon.

Program PR4

Program PR4 is the second in the series of output programs of the model and is used to print the profit and loss statement of the company for each year of the planning horizon. It also prints the equity sales, if any are required, and the set of SBU market share options used in the case which was run.

Program PR6

Program PR6 is the third program in the series used to obtain output of the model and is used with the SBU profit and loss data file Table XXIII, and the set of SBU market share options, to obtain the sales by year and the growth in sales for the entire period. Because the program must process the entire file to obtain the desired values, it requires approximately twenty minutes of terminal connect time and is expensive to operate.

Program PR9

Program PR9 is used to obtain computer run W1 for use with the interactive sequence of Program ER6 to find the restricted optimum. Program PR9 uses the intermediate results of Program ER2 to obtain the sum of the amount each SBU contributes to the measurement criteria in question; however, PR9 may require reprogramming if other measurement criteria are used.

PLEASE NOTE:

The appendices contain very light and broken print. Filmed as received, best copy available.

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PROGRAM ER2
SECTION I OF THE MODEL

```

00100 PRINT "STARTED"
00110 DIM P(10,5)
00120 DIM A(15)
00130 DIM S(15)
00150 DIM C(10)
00170 DIM T(10)
00180 DIM W(20,3)
00190 PRINT "INPUT NUMBER OF SBU L=K; NUMBER OF YEARS J=N"
00200 INPUT L,J
00210 DIM V(20),R(20,3),D(20,3)
00240 PRINT "ENTER CASE TYPE I=1, II=2,ETC"
00250 INPUT H
00260 MAT GET "C",C(10)
00280 GO TO 290
00290 GO SUB 600
00300 PRINT "ANOTHER CASE INPUT Q=1, OTHERWISE 0"
00310 INPUT Q
00320 IF Q=1 THEN 340
00330 STOP
00340 RESET "S13","PPR","A13","C"
00350 GO TO 100
00400 MAT GET "A13",A(15)
00404 IF A(12)=76 THEN 570
00405 A(12)=A(12)-72
00406 IF A(9)=111 THEN 409
00407 A(9)=A(1)+A(2)+A(3)-A(4)-A(5)
00408 IF A(9)>=0 THEN 410
00409 A(9)=0
00410 IF A(12)=J THEN 550
00420 IF A(15)=999 THEN 510
00430 A(6)=A(1)+A(2)+A(3)
00440 A(7)=A(6)-A(4)
00450 A(8)=A(7)-A(5)
00460 IF A(8)<=0 THEN 530
00470 Y=A(8)/(1+C(1))**A(12)
00480 R(A(11),A(13))=Y+R(A(11),A(13))
00490 MAT PUT "AAA",A
00500 GO TO 400
00510 MAT PUT "DAA",D
00511 MAT PUT "ERR",R
00512 CLOSE "DAA","ERR"
00513 RETURN
00530 A(8)=1
00540 GO TO 470
00550 D(A(11),A(13))=A(9)/(1+C(1))**A(12)
00560 GO TO 430

```

```

00570 IF A(11)=15 THEN 575
00571 GO TO 405
00575 IF A(13)<3 THEN 405
00576 A(15)=777
00580 GO TO 405
00600 PRINT"FOR CASE I : V(K) IS GIVEN"
00630 IF H=1 THEN 680
00640 IF H=2 THEN 660
00650 STOP
00660 GO SUB 800
00670 GO TO 710
00680 FOR K=1TOL
00690 READ V(K)
00700 NEXT K
00710 GO SUB 1300
00720 MAT PUT "PEA",P
00721 PUT "CMM",J,L,H
00722 MAT PUT "VK",V
00723 MAT PUT "WWW",W
00724 MAT PUT "DDD",D
00725 PRINT "FIRST PHASE COMP.,TYPE'END', THEN 'EDIT EX3 BASIC' TO GO
"
00726 RETURN
00800 FOR N=1 TO J
00805 MAT GET "PPH",T(10)
00810 IF T(10)=999 THEN 870
00815 FOR K=1 TOL
00820 MAT GET "S13",S(15)
00821 S(12)=S(12)-72
00822 IF S(9)<0 THEN 824
00823 IF S(9)<= 1 THEN 825
00824 S(9)=0.375
00825 IF S(15)=999 THEN 870
00830 IF S(11)=K THEN 835
00833 GO TO 870
00835 Y=S(8)*(1-S(9)*T(6))
00840 Z=(1+C(1))*S(12)
00845 Y=Y/Z
00850 W(S(11),S(13))=Y+W(S(11),S(13))
00855 IF S(15)=777 THEN 875
00860 IF S(15)=555 THEN 880
00865 GO TO 820
00870 PRINT "OUT OF SEQ. IN MP1",S(11);K
00872 STOP
00875 NEXT K
00880 NEXT N
00881 MAT GET "DAA",D(20,3)
00882 MAT GET "RRR",R(20,3)
00885 FOR K=1 TO L
00890 FOR I=1 TO 3
00895 R(K,I)=W(K,I)+D(K,I)
00900 NEXT I

```

```

00905 NEXT K
00910 FOR K=1TOL
00915 IF R(K,1)>R(K,2)THEN 1035
00920 IF R(K,2)>R(K,3)THEN 960
00925 D (K,3)=R(K,3)-R(K,2)
00930 D(K,2) =R(K,2)-R(K,1)
00935 D(K,1)=R(K,1)
00940 W(K,1)=1
00945 W(K,2)=2
00950 W(K,3)=3
00955 GO TO 1145
00960 IF R(K,3)>=R(K,1)THEN 1000
00965 D(K,3)=R(K,2)-R(K,1)
00970 D(K,2)=R(K,1)-R(K,3)
00975 D(K,1)=R(K,3)
00980 W(K,1)=3
00985 W(K,2)=1
00990 W(K,3)=2
00995 GO TO 1145
01000 D(K,3)=R(K,2)-R(K,3)
01005 D(K,2)= R(K,3)-R(K,1)
01010 D(K,1)=R(K,1)
01015 W(K,1)=1
01020 W(K,2)=3
01025 W(K,3)=2
01030 GO TO 1145
01035 IF R(K,3)>=R(K,2)THEN 1075
01040 D(K,3)=R(K,1)-R(K,2)
01045 D(K,2)=R(K,2)-R(K,3)
01050 D(K,1)=R(K,3)
01055 W(K,1)=3
01060 W(K,2)=2
01065 W(K,3)=1
01070 GO TO 1145
01075 IF R(K,3)>=R(K,1)THEN 1115
01080 D(K,3)=R(K,1)-R(K,3)
01085 D(K,2)=R(K,3)-R(K,2)
01090 D(K,1)=R(K,2)
01095 W(K,1)=2
01100 W(K,2)=3
01105 W(K,3)=1
01110 GO TO 1145
01115 D(K,3)=R(K,3)-R(K,1)
01120 D(K,2)=R(K,1)-R(K,2)
01125 D(K,1)=R(K,2)
01130 W(K,1)=2
01135 W(K,2)=1
01140 W(K,3)=3
01145 NEXT K
01150 PRINT "DONE WITH D&W PHASE IN MP1-II"
01153 FOR K=1 TO L
01154 PRINT K;D(K,3);W(K,3)

```

```

01155 IF D(K,3)>0 THEN 1195
01160 D(K,3)=D(K,2)
01165 D(K,2)=D(K,1)
01170 D(K,1)=1.0E+30
01175 W(K,3)=W(K,2)
01180 W(K,2)=W(K,1)
01185 W(K,1)=0
01190 GO TO 1155
01195 V(K)=W(K,3)
01200 NEXT K
01214 RESET "PPR","S13"
01215 RETURN
01300 FOR N=1 TO J
01305 MAT GET "PPR",T(10)
01310 IF T(10)=999 THEN 1400
01315 FOR K=1 TO L
01320 MAT GET "S13",S(15)
01325 IF S(15)=999 THEN 1400
01330 IF S(11)=K THEN 1335
01333 GO TO 1365
01335 IF V(K)=S(13) THEN 1340
01337 GO TO 1350
01340 T(1)=S(8)+T(1)
01341 IF S(9)<0 THEN 1343
01342 IF S(9)<=1 THEN 1345
01343 S(9)=0.375
01345 T(7)=S(9)*S(8)+T(7)
01350 IF S(15)=777 THEN 1375
01355 IF S(15)=555 THEN 1380
01360 GO TO 1320
01365 PRINT "OUT OF SEQ. IN CON",S(11);K
01370 STOP
01375 NEXT K
01380 FOR I=1 TO 10
01382 P(I,N)=T(I)
01383 PRINT I;N;P(I,N)
01390 NEXT I
01391 PRINT
01395 NEXT N
01400 PRINT "DONE IN CON";T(10);S(15)
01410 RETURN
03000 DATA 1,1,1,1,1,1,1,1,3,1,2,1,3,2,1,2,2,1,1
03010 DATA 0,1,3
03020 DATA 3,2,0
EDIT END

```

PROGRAM ER6
SECTION II OF THE MODEL

```
00725 GET "CMM",J,L,H
00730 DIM Z(15),P(10,5)
00731 DIM F(24),M(20,2)
00740 DIM B(15,6),A(15),C(10),V(20),E(5)
00755 MAT GET "C",C(10)
00760 C(3)=.4
00765 MAT GET "PEA",P(10,J)
00780 DIM W(10,6)
00795 MAT GET "VK",V(L)
01500 MAT GET "BBR",Z(15)
01505 T2=0
01510 FOR I=1 TO 15
01515 B(1,I)=Z(I)
01520 NEXT I
01570 FOR N=1 TO J
01575 FOR I=1 TO 24
01576 F(I)=0
01577 NEXT I
01578 E(N)=0
01580 FOR K=1 TO L
01585 MAT GET "AAA",A(15)
01586 IF V(K)=0 THEN 3600
01595 IF A(11)=K THEN 1600
01597 GO TO 1655
01600 IF A(13)=V(K) THEN 1605
01603 GO TO 1635
01605 IF A(12)=N THEN 1610
01607 GO TO 1655
01610 F(2)=A(1)+F(2)
01615 F(3)=A(2)+F(3)
01620 F(5)=A(3)+F(5)
01625 F(6)=A(4)+F(6)
01630 F(7)=A(5)+F(7)
01635 IF A(15)=777 THEN 1650
01640 IF A(15)=555 THEN 1665
01645 GO TO 1585
01650 NEXT K
01655 STOP
01665 B(2,N)=F(2)
01670 B(3,N)=F(3)
01675 B(5,N)=F(5)
01680 B(6,N)=F(6)
01685 B(7,N)=F(7)
01690 GO SUB 2400
01695 G=0
01696 IF P(5,N)>0 THEN 1700
01697 B(14,N)=0
```

```

01698 GO TO 1705
01700 B(14,N)=C(2)*P(5,N)
01705 B(1,N)=0
01710 B(10,N)=B(10,N)+P(5,N)-B(14,N)
01715 F(12)=B(7,N)+B(8,N)
01720 B(12,N)=F(12)+B(9,N)+B(10,N)
01725 F(9)=E(2,N)+B(3,N)+E(4,N)
01730 B(11,N)=F(9)+B(5,N)-B(6,N)+B(1,N)
01735 IF G=4 THEN 2020
01740 B(1,N)=F(12,N)-B(11,N)
01745 B(15,N)=B(14,N)/B(13,N)
01750 F(8)=C(5)*(B(2,N)+B(3,N)+B(4,N))
01751 IF B(1,N)>=0 THEN 1755
01752 F(8)=F(8)-B(1,N)
01755 IF F(8)<=B(1,N) THEN 2000
01760 IF B(4,N)>=F(8) THEN 1985
01765 IF B(4,N)=0 THEN 1785
01770 IF B(4,N)<0 THEN 1955
01775 B(1,N)=B(1,N)+B(4,N)
01776 F(8)=F(8)-B(4,N)
01780 B(4,N)=0
01785 F(10)=F(8)
01790 F(11)=F(9)+F(8)
01795 IF C(4)>F(11)/F(12) THEN 1840
01800 IF C(4)>F(11)/(F(12)+F(10)) THEN 1820
01805 B(1,N)=B(1,N)+F(10)
01810 B(8,N)=B(8,N)+F(10)
01815 GO TO 1855
01816 F(1)=-B(10,N)
01817 B(10,N)=0
01818 GOTO 1865
01820 F(13)=F(11)/C(4)-F(12)
01825 B(1,N)=B(1,N)+F(13)
01830 B(8,N)=B(8,N)+F(13)
01835 F(10)=F(10)-F(13)
01840 B(1,N)=B(1,N)+F(10)
01845 B(9,N)=B(9,N)+F(10)
01855 IF B(10,N)<=0 THEN 1865
01856 F(14)=(B(8,N)+B(9,N))/B(10,N)
01860 IF C(3)>=F(14) THEN 2235
01861 F(1)=0
01865 F(15)=B(8,N)+B(9,N)-C(3)*B(10,N)
01870 E(N)=F(15)/(C(3)+1)+F(1)
01875 IF G=2 THEN 2070
01880 B(10,N)=B(10,N)+E(N)
01885 IF E(N)>B(8,N) THEN 1965
01890 B(8,N)=B(8,N)-E(N)
01895 F(16)=B(13,N)*C(8)/(1-C(8))
01900 F(17)=C(9)*P(5,N)/B(13,N)
01905 F(18)=F(16)*F(17)
01910 IF E(N)<=F(16) THEN 1940
01915 IF H=2 THEN 2035

```

```

01925 PRINT "1 TO GO ON"
01930 INPUT T
01935 IF T=0 THEN 1960
01940 F(19)=E(N)/F(17)
01945 B(13,N)=B(13,N)+F(19)
01950 GO TO 2235
01955 PRINT "ER ZT R5";B(4,N);N
01960 STOP
01965 F(20)=E(N)-B(8,N)
01970 B(8,N)=0
01975 B(9,N)=B(9,N)-F(20)
01980 GO TO 1895
01985 F(24)=(F(8)-B(1,N))/(1+C(5))
01986 B(1,N)=B(1,N)+F(24)
01990 B(4,N)=B(4,N)-F(24)
01991 IF B(4,N)>=0 THEN 2060
01992 B(9,N)=B(9,N)-B(4,N)
01993 B(4,N)=0
01995 GO TO 2060
02000 F(21)=B(1,N)-F(8)
02005 B(1,N)=F(8)
02010 B(4,N)=B(4,N)+F(21)
02015 GO TO 2060
02020 GO TO 2280
02035 PRINT F(18)-E(N)
02036 GO TO 2500
02060 G=2
02065 GO TO 1855
02070 IF B(4,N)>=F(15) THEN 2130
02075 IF B(9,N)>=B(4,N) THEN 2180
02080 IF B(9,N)=0 THEN 2105
02085 B(4,N)=B(4,N)-B(9,N)
02090 E(N)=0
02095 B(9,N)=0
02100 GO TO 1855
02105 IF B(8,N)>=B(4,N) THEN 2160
02110 B(4,N)=B(4,N)-B(8,N)
02115 B(8,N)=0
02120 E(N)=0
02125 GO TO 2235
02130 B(4,N)=B(4,N)-F(15)
02131 E(N)=F(15)
02135 IF E(N)<=B(9,N) THEN 2220
02140 IF B(9,N)=0 THEN 2205
02145 E(N)=E(N)-B(9,N)
02150 B(9,N)=0
02155 GO TO 1855
02160 B(8,N)=B(8,N)-B(4,N)
02165 E(N)=0
02170 G=0
02175 GO TO 1855
02180 B(9,N)=B(9,N)-B(4,N)

```

```

02185 B(4,N)=0
02190 G=0
02195 E(N)=0
02200 GO TO 1855
02205 B(8,N)=B(8,N)-E(N)
02210 E(N)=0
02215 GO TO 2235
02220 B(9,N)=B(9,N)-E(N)
02225 E(N)=0
02235 F(22)=B(1,N)+B(2,N)+B(3,N)+B(4,N)
02240 F(22)=(F(22)-C(4)*B(7,N))/C(4)
02245 F(23)=B(8,N)+B(9,N)-F(22)
02246 IF F(23)>=0 THEN 2250
02247 F(22)=B(8,N)+B(9,N)
02248 F(23)=0
02250 B(8,N)=F(22)
02255 B(9,N)=F(23)
02260 G=4
02265 GO TO 1715
02280 F(24)=0.2*(B(8,N)+B(9,N))
02281 IF F(24)>B(8,N) THEN 2284
02282 B(8,N)=F(24)
02283 B(9,N)=4*F(24)
02284 B(4,N+1)=B(4,N)
02285 B(8,N+1)=B(8,N)
02290 B(9,N+1)=B(9,N)
02295 B(10,N+1)=B(10,N)
02296 B(13,N+1)=B(13,N)
02300 MAT PUT "FFF",F
02305 NEXT N
02310 IF T3=0 THEN 2320
02315 IF T2=2 THEN 1500
02320 MAT PUT "BBB",B
02321 MAT PUT "EEE",E,V,P,Z,M,W
02325 PRINT T3
02330 STOP
02400 P(8,N)=B(4,N)*C(7)
02401 F(1)=P(2,N)
02405 P(2,N)=P(2,N)-P(8,N)
02410 P(3,N)=C(6)*(B(8,N)+B(9,N))
02415 P(9,N)=P(7,N)-P(2,N)-P(3,N)
02420 P(4,N)=P(9,N)*P(6,N)
02425 P(5,N)=P(1,N)-P(2,N)-P(3,N)-P(4,N)
02426 P(2,N)=F(1)
02430 PRINT "CPL COMP";N
02435 RETURN
02500 PRINT "INPUT NEW K AND V(K)"
02505 INPUT X,Y
02506 K(X,2)=N
02507 K(X,1)=V(X)
02510 V(X)=Y
02515 PRINT "ANOTHER CHANGE ENTER 1 OTHERWISE "

```

```

02520 INPUT U
02525 IF U=1 THEN 2505
02535 FOR I=1 TO J
02540 P(1,I)=0
02545 P(7,I)=0
02555 FOR X=1 TO 11 STEP 10
02560 MAT GET "TTT",W
02564 FOR K=1 TO 10
02570 IF V(K+X-1)=0 THEN 2595
02575 P(1,I)=W(K,V(K+X-1))+P(1,I)
02590 P(7,I)=W(K,V(K+X-1)+3)+P(7,I)
02595 NEXT K
02600 NEXT X
02605 NEXT I
02670 RESET "TTT"
02674 T3=3
02675 T2=2
02676 PRINT"BEEN TO MP3";E(N);N
02677 RESET "BBF","AAA"
02680 GO TO 2310
02685 M(K,2)=N
02686 M(K,1)=W(K,3)
03600 IF M(K,2)>N THEN 1635
03605 IF M(K,2)=N THEN 3620
03610 IF M(K,1)=A(13) THEN 1605
03615 GO TO 1635
03620 IF M(K,1)=A(13) THEN 3630
03625 GO TO 1635
03630 B(4,N)=B(4,N)+A(9)
03635 GO TO 1635

```

PROGRAM ERP
THE PROBABILITY SECTION OF THE MODEL

```
EDIT LIST
00725 GET "CKK",J,L,H
00731 DIM F(20),B(15)
00740 DIM A(15),G(20,5)
00741 DIM V(20),S(15),M(5,6)
00795 MAT GET "VR",V(L)
00800 FOR K=1 TO 20
00805 FOR I=1 TO 5
00810 READ G(K,I)
00815 NEXT I
00820 NEXT K
00830 PRINT "INPUT CORP. TAX RATE .XX"
00835 INPUT C
01570 FOR N=1 TO J
01575 FOR I=1 TO 20
01576 F(I)=0
01577 NEXT I
01580 FOR K=1 TOL
01585 MAT GET "AAA",A(15)
01586 IF V(K)=0 THEN 3600
01595 IF A(11)=K THEN 1600
01597 GO TO 1655
01600 IF A(13)=V(K) THEN 1605
01603 GO TO 1635
01605 IF A(12)=N THEN 1610
01607 GO TO 1655
01610 GO TO 2610
01635 IF A(15)=777 THEN 1650
01640 IF A(15)=555 THEN 1665
01645 GO TO 1585
01650 NEXT K
01655 PRINT "1655"
01660 STOP
01665 GO TO 1720
01720 FOR K=1 TO L
01725 MAT GET "S13",B(15)
01726 IF B(9)<0 THEN 1729
01727 IF B(9)<=1 THEN 1730
01729 B(9)=.375
01730 IF V(K)=B(13) THEN 1740
01735 GO TO 1750
01740 U=B(9)*B(3)*C
01743 GO SUB 2000
01745 F(9)=F(9)+Y
01747 F(10)=F(10)+X
01750 IF B(15)=777 THEN 1765
01755 IF B(15)=555 THEN 1770
```

```

01760 GO TO 1725
01765 NEXT K
01770 FOR K=1 TO 14
01775 PRINT F(K);
01780 NEXT K
01785 PRINT
01800 F(13)=F(1)+F(3)+F(5)-F(7)
01805 F(14)=F(2)+F(4)+F(6)+F(8)
01820 FOR K=1 TO 6
01825 M(N,K)=F(K+6)
01830 NEXT K
01900 NEXT N
01905 MAT GET"BER",A(15)
01910 F(15)=A(2)+A(3)+A(5)-A(6)-A(7)
01915 F(16)=F(15)-M(1,5)+M(1,3)+M(1,1)
01920 F(17)=M(1,2)+M(1,4)+M(1,6)
01925 PRINT "YEAR","EXPECTED CASH CHANGE","VARIANCE CHANGE"
01930 PRINT "1";" "F(16);" "F(17)
01935 FOR N=2 TO J
01940 F(18)=M(N-1,5)-M(N,5)+M(N,1)
01945 F(19)=M(N-1,6)+M(N,6)+M(N,2)
01950 PRINT "N;" "F(18);" "F(19)
01955 NEXT N
01960 PRINT "YEAR","EXPECTED PROFIT","PROFIT VARIANCE"
01965 FOR N=1 TO J
01970 PRINT "N;" "M(N,1);" "M(N,2)
01975 NEXT N
01980 PRINT "DONE"
01990 STOP
02000 Z=K
02001 GO TO 2045
02002 Z=RND
02003 Z=10*Z
02004 Z=INT(Z)
02005 PRINT Z;
02010 IF Z<=5 THEN 2025
02015 Z=RND
02016 Z=10*Z
02017 Z=INT(Z)
02020 GO TO 2040
02025 Z=RND
02026 Z=10*Z
02027 Z=INT(Z)
02030 Z=10+Z
02040 Z=Z+1
02041 PRINT Z;
02045 Y=Y*(G(Z,1)*G(Z,2)+G(Z,3)+G(Z,4)*G(Z,5))
02050 X=Y*(G(Z,1)*G(Z,1)*G(Z,2)+G(Z,3)+G(Z,4)*G(Z,4)*G(Z,5))-Y*Y
02060 RETURN
02610 W=A(1)
02615 GO SUB 2000
02620 F(1)=F(1)+Y

```

```

02625 F(2)=F(2)+X
02640 W=A(2)
02645 GO SUB 2000
02650 F(3)=F(3)+Y
02655 F(4)=F(4)+X
02670 W= A(3)-A(4)
02675 GO SUB 2000
02680 F(5)=F(5)+Y
02685 F(6)=F(6)+X
02700 W=A(5)
02705 GO SUB 2000
02710 F(7)=F(7)+Y
02715 F(8)=F(8)+X
02740 GO TO 1635
03600 IF N>1 THEN 1635
03605 PRINT"SRU"K;"LIQUIDATED, INPUT OPTION ""#0,1,2,3"
03610 INPUT T
03620 IF T=A(13) THEN 3630
03625 GO TO 1635
03630 W=A(9)
03635 GO SUB 2000
03640 F(11)=F(11)+Y
03645 F(12)=F(12)+X
03650 GO TO 1635
04000 DATA .8,.3,.6,1.1,.1,.7,.3,.6,1.2,.1,.6,.2,.6,1.3,.2
04010 DATA .8,.4,.4,1.2,.2
04015 DATA .8,.4,.4,1.1,.2,.8,.4,.5,1.2,.1
04020 DATA .7,.2,.7,1.1,.1,.7,.4,.4,1.1,.2,.7,.5,.4,1.1,.1
04025 DATA .7,.1,.8,1.1,.1,.7,.1,.8,1.2,.1,.6,.3,.5,1.2,.2
04030 DATA .6,.3,.6,1.3,.1,.6,.1,.8,1.3,.1,.6,.2,.7,1.3,.1
04035 DATA .8,.3,.5,1.1,.2,.8,.2,.5,1.1,.3,.8,.2,.6,1.1,.2
04040 DATA .7,.3,.5,1.1,.2,.6,.4,.5,1.2,.1
EDIT END

```

PROGRAM PR3
TO PRINT OUT BALANCE SHEET AND STATISTICS

```

010 DIM B(15,6)
011 Y=0
012 DIM C(10),D(15)
013 PRINT"INPUT C(2)"
014 INPUT C
015 C(2)=C
016 MAT GET"EDR",B(15)
020 MAT GET"EBB",B(15,6)
030 FOR N=1 TO 5
040 FOR I=1 TO 4
050 PRINT B(I,N),B(I+6,N)
060 NEXT I
070 PRINT B(5,N)-B(6,N)
080 PRINT B(11,N),B(12,N)
090 PRINT B(13,N);B(14,N);B(15,N)
094 S=0.15
095 PRINT
096 X=B(10,N)/(1+S)**N
097 Y=Y+X
100 Z(N)=B(15,N)/C(2)
110 W(N)=B(14,N)/(C(2)*B(10,N))
115 T(N)=B(14,N)/(C(2)*B(11,N))
120 U(N)=(B(8,N)+B(9,N))/B(10,N)
125 R(N)=B(8,N+1)+B(9,N+1)-B(8,N)-B(9,N)
190 NEXT N
210 PRINT"PRESENT VALUE OF EQUITY="Y
215 PRINT "GROWTH IN TOTAL ASSETS(%)="(B(11,5)/B(11,1)-1.0)*100
220 PRINT "GROWTH IN EPS (PERCENT)="(Z(5)/Z(1)-1.0)*100
225 PRINT"EARNINGS PER SHARE="Z(1);Z(2);Z(3);Z(4);Z(5)
230 PRINT "RETURN ON EQUITY="W(1);W(2);W(3);W(4);W(5)
235 PRINT"RETURN ON NET ASSETS="T(1);T(2);T(3);T(4);T(5)
240 PRINT"DEBT TO EQUITY PER YEAR="U(1);U(2);U(3);U(4);U(5)
245 R(6)=B(8,N)+B(9,N)-D(8)-D(9)
245 PRINT "CHANGE IN INTEREST TYPE DEBT="R(6);R(1);R(2);R(3);R(4);R(5)
250 Q(1)=B(1,1)+B(4,1)-D(1)-D(4)
255 FOR N=1 TO 4
260 Q(N+1)=B(1,N+1)+B(4,N+1)-B(1,N)-B(4,N)
265 NEXT N
270 PRINT"CHANGE IN CASH BY YR="Q(1);Q(2);Q(3);Q(4);Q(5)
350 STOP

```

PROGRAM PR4
TO PRINT OUT PROFIT AND LOSS STATEMENT

```

00010 DIM P(10,5),A(145)
00020 MAT GET "EEE",A(25)
00030 MAT GET "EEE",P(10,5)
00040 FOR I=1 TO 10
00050 FOR N=1 TO 5
00060 PRINT P(I,N);
00070 NEXT N
00080 PRINT
00090 NEXT I
00100 PRINT"EQUITY SALES="A(1);A(2);A(3);A(4);A(5)
00110 PRINT"SEU SET=";
00115 FOR N=1 TO 20
00120 PRINT A(N+5);
00130 NEXT N
00200 STOP
EDIT END

```

PROGRAM PR6
TO PRINT OUT GROWTH IN SALES

```

READY EDIT PR6 BASIC
EDIT LIST
00010 DIMX(25),Z(15)
00012 GET"CMM",J,L,H
00015 MAT GET"EEE",X(25)
00020 FOR I=1 TO J
00025 Y(I)=0
00030 FOR K=1 TO L
00035 MAT GET"S13",Z(15)
00040 IF X(K+5)=Z(13) THEN 50
00045 GO TO 55
00050 Y(I)=Y(I)+Z(1)
00055 IF Z(15)=777 THEN 80
00060 IF Z(15)=555 THEN 90
00070 GO TO 35
00080 NEXT K
00090 NEXT I
00095 PRINT "SALES PER YEAR="Y(1);Y(2);Y(3);Y(4);Y(5)
00110 PRINT"GROWTH IN SALES (Z)="(Y(5)/Y(1)-1.0)*100
00200 STOP
EDIT END

```

PROGRAM PR9
TO PRINT OUT COMPUTER RUN W-1

```
00010 DIM A(20,3),B(20,3)
00020 MAT GET"DDD",A(20,3)
00030 MAT GET "WWW",B(20,3)
00035 PRINT "TABLE OF W &D"
00040 FOR K=1 TO 20
00045 PRINT K
00050 FOR I=1TO3
00060 PRINT B(K,I);A(K,I),
00070 NEXT I
00075 NEXT K
00090 STOP
```

APPENDIX C

COLLECTION OF SPECIFIC RUN RESULTS

I. LIST OF COMPUTER RUNS FOUND IN APPENDIX C

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P1	241
P2	241
P3	242
P4	243
W1	245

II. OVERVIEW

This appendix contains a collection of the specific run results, along with a chart which gives a definition of each line in the computer print-out of the balance sheet to aid in identifying those lines which are not labeled. A final section gives the SBU market share options used in each run.

III. DISCUSSION

Each of the major runs of the model are found in this appendix, and Tables XVIII through XX serve as a partial index to the runs. Programming labels in the Basic language, although possible, is not convenient and definitely takes up valuable computer time and space, and therefore labels were not printed by the computer.

See Figure 14 for the layout of the balance sheet which is printed by computer run ER6. Line one refers to the first line of each block of numbers printed. Refer to Page 1 of Computer Run A0 and note that line

TABLE XVIII

SUMMARY OF COMPUTER RUNS

Computer Run	Policy ¹ Case	Measure- ¹ ment Case	Debt to Equity Ratio	Div. Rate	Title
A0	-	-	.6	.2	Company management case
A1	-	I	.6	.2	Present value of shareholder equity
A2-1	I	I	.6	.1	"
A2-2			.6	.3	"
A3-1	II	I	.45	.2	"
A3-2			.5	.2	"
A4	III	I	.6	.2	The SBU which give maximum market share
A5-1	IV	I	.6	.2	The SBU which give minimum market share
A5-2			.6	.2	The SBU which give medium market share
A6	V	I	.6	.2	With only SBU #18 Option 1
A7-1	VI	I	.6	.2	With SBU except #18
A7-2	VI	I	.6	.2	With SBU #18 Option #2
A7-3	VI	I	.6	.2	With SBU #18 Option #3
B1	-	II	.6	.2	For growth in earnings per share

TABLE XIX

CONTINUATION OF TABLE XVIII

Computer Run	Policy Case ¹	Measurement Case ¹	Debt to Equity Ratio	Div. Rate	Title
B2-1	I	II	.6	.3	For growth in earnings per share
B2-2			.6	.1	"
B3-1	II	II	.5	.2	"
B3-2			.45	.2	"
E1	-	V	.6	.2	For growth in sales
E2-1	I	V	.6	.3	"
E2-2			.6	.1	"
E3-1	II	V	.5	.2	"
E3-2			.45	.2	"
F1	-	- ²	.6	.2	For return on assets employed

¹ See Figure 7 for a description of policies and measurements investigated. Measurement Cases III and IV are identical to Case I.

² Special case of measurement factor I using present value of shareholder equity divided by the present value of assets employed

TABLE XX

SUMMARY OF COMPUTER RUNS IN JOINT EFFECTS STUDY

<u>Computer Run</u>	<u>Dividend Rate</u>	<u>Debt to Equity Ratio</u>
J1	.3	.5
J2	.3	.45
J3	.3	.7
J4	.2	.7
J5	.1	.7
J6	.1	.45
J7	.1	.5
J8	.1	.4
J9	.1	.3
J10	.3	.4
J11	.3	.3
J12	.2	.4
J13	.2	.3
A1	.2	.6
A2-1	.1	.6
A2-2	.3	.6
A3-1	.2	.45
A3-2	.2	.50

Line 1	Cash	Payables
Line 2	Inventories	Short Term Debt
Line 3	Receivables	Long Term Debt
Line 4	Investments	Shareholders Equity
Line 5	Plant, Equipment and Land, less accumulated depreciations	
Line 6	Total Net Assets	Total Liabilities
Line 7	Shares of Stock Outstanding	Dividends Declared
		Dividends Per Share

Figure 14. Guide to layout of balance sheet printouts.

one contains the number 4602.297, and the succeeding first lines are 3761.860; 4536.457; 5278.277; and 6129.609.

See Figure 10 of Appendix A for the layout of the profit and loss portions of the output as printed by Program PR4, but note that each column represents one year in the planning horizon. Thus from the second page of Computer Run AO, the total SBU contribution for year three of the study is 16664 and the net profit after tax in year five is 12192.70.

The right-hand side of the second page of some of the computer runs, is difficult to read because the computer output terminal may execute a carriage return in the middle of a number, and if it does, the remainder of the number is found at the start of the next line.

Table XXI lists the SBU market share options which were used in the computer runs listed in this appendix.

Figure 15 is a guide to the layout of the probability run printout labeled Computer Run P1 through P4. The format of the three lines shown are repeated for each year in the planning horizon. The last two sections of the printout contain the mean cash flow and variance for the year listed, and the last lines contain the mean profit and variance.

Line 1	Mean of Inventory	Variance of Inventory	Mean of Receivables	Variance of Receivables	Mean Net Plant and Equipment	Variance Net of Plant and Equipment
Line 2	Mean of Payables	Variance of Payables	Mean of Profit	Variance of Profit		
Line 3	Mean of Liquidation Value	Variance of Liquidation Value	Zero	Zero		

Figure 15. Guide to layout of probability run printouts.

TABLE XXI
THE MARKET SHARE OPTIONS WHICH ARE IN THE OPTIMUM SET FOR EACH CASE

Computer Run	SBU Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A0	1	1	1	1	1	1	1	1	1	3	1	2	1	3	2	1	2	2	1	1
A1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
A2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
A3	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
A4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
A5-2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2
A6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
A7-1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	0	1	1
A7-2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	2	1	1
A7-3	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	3	1	1
B	1	2	1	1	1	1	1	1	1	3	1	2	1	2	2	1	1	1	1	1
E	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
F1	1	3	1	1	1	2	1	2	1	1	1	1	1	2	2	1	1	2	2	3
J1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J3	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J4	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J5	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J6	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J7	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J8	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J9	0	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
J10	1	1	0	1	1	1	1	0	1	0	1	1	1	0	2	0	1	1	1	0
J11	1	1	1	1	1	0	1	1	1	1	1	1	1	3	0	1	1	1	1	1
J12-1	1	1	1	1	1	1	1	1	0	1	1	1	1	3	2	1	1	1	1	1
J13	1	1	1	1	0	1	1	1	1	1	1	0	1	3	2	1	1	1	1	1
F1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
F2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
F3	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	0	1	1
F4	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1
W1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1

COMPUTER RUN AO
COMPANY MANAGEMENT CASE

EDIT RUH
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0

EDIT END
READY EDIT PR3 BASIC
EDIT RUH
INPUT C(2)

?	.2	
4602.297		6041
19610		3935.100
15905		15740.40
836.6289		32732.50
17555		
58508.90		58509
4525	1662.870	.3674859

3761.860		6251
20317		3935.100
16465		15740.40
5212.699		39942.10
20112		
65868.50		65868.56
4525	1787.410	.3950080

4536.457		6869
22299		3935.090
17853		15740.40
8571.859		48040.90
21325		
74585.25		74585.25
4525	2024.680	.4474440

5278.277		7593
24689		3935.090
19522		15740.40
12786.10		56924.90
21918		
84193.25		84193.25
4525	2221.010	.4908299

6129.609		8319
27249		3935.090
21261		15740.40
17636.90		66679
22397		
94673.38		94673.38
4525	2438.540	.5389040

```

PPRESENT VALUE OF EQUITY= 156003.2
GROWTH IN TOTAL ASSETS(%)= 61.81020
GROWTH IN EPS (PERCENT)= 46.64612
EARNINGS PER SHARE= 1.837429    1.975039    2.237220    2.454149    2.69
4519
RETURN ON EQUITY= .2535443    .2237502    .2107247    .1950825    .18285
67
RETURN ON NET ASSETS= .1421040    .1356802    .1357293    .1318995    .1
287870
DEBT TO EQUITY PER YEAR= .5999998    .4926004    .4095570    .3456394
.2950777
CHANGE IN INTEREST TYPE DEBT=-10007.51    -3.906250E-03    -1.171875E-02    0
0    0
CHANGE IN CASH BY YR=-8906.074    3535.633    4133.754    4956.059    57
02.133
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13629    15322    16664    18701    20890
1500    1750    1000    1300    1600
2083.410    1377.280    1377.280    1377.280    1377.280
2571.860    3324.600    4580.309    5604.430    6742.898
8314.359    8937.047    10123.40    11105    12192.70
.5000000    .5000000    .5000000    .5000000    .5000000
7886.500    9709.547    11120.90    13200.40    15440.20
840.6399    66.93030    417.0159    685.7488    1022.890
5143.727    6649.188    9160.629    11208.90    13485.80
1    2    3    4    5
EQUITY SALES= 0    0    0    0    0
S3U SET= 1    1    1    1    1    1    1    1    1    3    1
2    1    3    2    1    2    2    1
1
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 74426    82843    90434    98974    108906
GROWTH IN SALES (%)= 46.32787

```

COMPUTER RUN A1
PRESENT VALUE OF SHAREHOLDERS
EQUITY

EDIT RUN
CPL COMP 1
CPL COMP 2

CPL COMP 3
CPL COMP 4
CPL COMP 5
0

EDIT EH
EDIT SAVE
EDIT EHD
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)

?	.2		
4533.977		6041	
19774		3984.670	
16105		15938.70	
0		33205.60	
18757			
59170		59170	
4566.008	1671.470		.3693860

3814.200		6266	
20571		3984.670	
17571		15938.70	
3633.490		40334.30	
20934			
66523.56		66523.69	
4566.008	1782.180		.3903150

4604.637		7001	
22875		3984.670	
19538		15938.70	
6181.590		48762.90	
22488			
75687.19		75687.19	
4566.008	2107.130		.4614820

5346.957		7840	
25582		3984.670	
21706		15938.70	
10462		58509.60	
23176			
86272.88		86272.88	
4566.008	2436.690		.5336580

6275.199	8776
28401	3984.670
23889	15938.70
15982.40	69385.25
23537	
98084.56	90084.56
4566.008	2718.930 .5954720

PRESENT VALUE OF EQUITY= 159385.2
 GROWTH IN TOTAL ASSETS (%)= 65.76738
 GROWTH IN EPS (PERCENT)= 61.20586
 EARNINGS PER SHARE= 1.846930 1.951574 2.307409 2.668289 2.97
 7360
 RETURN ON EQUITY= .2516850 .2209262 .2160587 .2082300 .19593
 00
 RETURN ON NET ASSETS= .1412430 .1339510 .1391999 .1412199 .1
 386013
 DEBT TO EQUITY PER YEAR= .6000002 .4939560 .4085763 .3405145
 .2871412
 CHANGE IN INT TYPE DEBT=-3.906250E-03 -3.906250E-03 -3.906250E-03 -3.
 906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR=-9811.023 2913.711 3338.533 5022.730 64
 48.641

EDIT END
 READY EDIT PR4 BASIC
 EDIT RUN

13715	15354	17257	20195	22798
1500	1750	1000	1300	1600
2083.410	1394.640	1394.640	1394.640	1394.630
2614.860	3298.460	4617.367	5811.449	7045.656
8357.359	8910.900	10535.70	12183.40	13594.70
.5000000	.5000000	.5000000	.5000000	.5000000
7972.500	9741.547	11338.70	13823	16249
840.6399	0	290.6790	494.5269	836.9609
5229.727	6596.906	9234.738	11622.90	14091.30

EQUITY SALES= 378.7378 0 0 0 0
 SBU SET= 1 1 1 1 1 1 1 1 1 1
 1 1 3 2 1 1 1 1

EDIT END
 EDIT RUN
 SALES PER YEAR= 74426 82922 92001 102825 114772
 GROWTH IN SALES (%)= 54.20952

COMPUTER RUN A2-1
PRESENT VALUE OF SHAREHOLDERS EQUITY

```

EDIT  RUN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT  END
READY EDIT PR3
0170      INU SYN
READY EDIT PR3 BASIC
EDIT  RUN
INPUT C(2)
? .1
4609.957      6041
19774      4039.510
16105      16158.10
655.2300    33662.60
18757
59901.10    59901.20
4525      835.7358      .1846930

3879.720    6266
20571      4039.510
17571      16158.10
5205.258    41697.40
20934
68160.88    68160.88
4525      892.7510      .1972930

4761.816    7001
22875      4039.510
19538      16158
8763.188    51227.40
22488
78426      78426
4525      1058.890      .2340100

5605.109    7840
25582      4039.510
21706      16158
14245.30    62276.80
23176
90314.25    90314.30
4525      1227.710      .2713169

```

6653.520 8776
 28461 4839.510
 23889 16158
 21132.50 74639.50
 23537
 103613 103613
 4525 1373.640 .3035670

PRESENT VALUE OF EQUITY= 167200
 GROWTH IN TOTAL ASSETS(%)= 72.97343
 GROWTH IN EPS (PERCENT)= 64.36299
 EARNINGS PER SHARE= 1.846930 1.972930 2.340100 2.713170 3.03
 5670
 RETURN ON EQUITY= .2482684 .2141024 .2067040 .1971377 .18403
 67
 RETURN ON NET ASSETS= .1395193 .1309771 .1350178 .1359376 .1
 325741
 DEBT TO EQUITY PER YEAR= .6000013 .4843853 .3942716 .3243183
 .2706007
 CHANG IN INTEREST TYPE DEBT=-9565.492 -3.906250E-03 -.1015625 -3.90
 6250E-03 -3.906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR=-9079.816 3819.790 4440.023 6325.402 79
 35.613

EDIT END
 READY EDIT PR4
 0170 INU SYN
 READY EDIT PR4 BASIC
 EDIT RUN

13715	15354	17257	20195	22798	
1500	1750	1000	1300	1600	
2083.410	1413.830	1413.830	1413.830	1413.830	
2614.860	3315.070	4670.637	5905.109	7187.387	
8357.359	8927.520	10588.90	12277.10	13736.40	
.5000000	.5000000	.5000000	.5000000	.5000000	
7972.500	9741.547	11338.70	13823	16249	
940.6399	52.41840	416.4199	701.0549	1139.620	
5229.727	6630.129	9341.289	11810.20	14374.80	

1 2 3 4 5
 EQUITY SALES= 0 0 0 0 0
 SSU SET= 1 1 1 1 1 1 1 1 1 1 1
 1 1 3 2 1 1 1 1
 1
 EDIT END

COMPUTER RUN A2-2
PRESENT VALUE OF SHAREHOLDERS EQUITY

EDIT RUN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5

INPUT C(2)

?	.3		
4458.008		6041	
19774		3978.970	
16105		15915.90	
0		33158.10	
18757			
59094		59094	
4651.367	2507.210		.5540790
3614.200		6266	
20571		3978.970	
17571		15915.90	
2667.110		39396.50	
20934			
65557.25		65557.25	
4651.367	2673.570		.5747920
4508.008		7001	
22875		3978.970	
19538		15915.90	
4231.977		46745.10	
22488			
73640.88		73640.88	
4651.367	3149.400		.6770920
5152		7840	
25582		3978.970	
21706		15915.90	
7338.477		55219.60	
23176			
82954.38		82954.38	
4651.367	3631.940		.7808310
5962.840		8776	
28401		3978.970	
23889		15915.90	
11530.10		64649.10	
23537			
93319.88		93319.88	
4651.367	4041.210		.8688220

```

PRESENT VALUE OF EQUITY= 153072.3
GROWTH IN TOTAL ASSETS(%)= 57.91759
GROWTH IN EPS (PERCENT)= 56.80475
EARNINGS PER SHARE= 1.846930    1.915973    2.256973    2.602770    2.89
6073
RETURN ON EQUITY= .2520461    .2262105    .2245798    .2192422    .20836
65
RETURN ON NET ASSETS= .1414250    .1359487    .1425567    .1459413    .1
443498
DEBT TO EQUITY PER YEAR= .6000004    .5049907    .4256033    .3602863
.3077362
CHANGE IN INTEREST TYPE DEBT=-9868.133    -1.171875E-02    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9886.992    2023.301    2258.671    3750.492    50
02.461
EDIT END
READY EDIT PR4
0170    INU SYN
READY EDIT PR4 BASIC
EDIT RUN
13715    15354    17257    20195    22798
1500    1750    1000    1300    1600
2083.410    1392.640    1392.640    1392.640    1392.640
2614.860    3299.450    4579.707    5734.457    6921.719
8357.359    8911.898    10498    12106.50    13470.70
.5000000    .5000000    .5000000    .5000000    .5000000
7972.500    9741.547    11338.70    13823    16249
840.6399    0    213.3690    338.5579    587.0789
5229.727    6598.898    9159.430    11468.90    13843.40
1    2    3    4    5
EQUITY SALES= 1167    0    0    0    0
SBU SET= 1    1    1    1    1    1    1    1    1    1
1    1    3    2    1    1    1    1
1
EDIT END

```

COMPUTER RUN A3-1
PRESENT VALUE OF SHAREHOLDERS EQUITY

EDIT RUN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5

EDIT RUN
INPUT C(2)

?	.2		
4533.977		6041	
19774		3297.660	
16105		13190.60	
0		36640.70	
18757			
59170		59170	
4937.977	1671.470		.3693360
3814.200		6266	
20571		3297.660	
17571		13190.60	
3729.680		43065.60	
20934			
66619.75		66619.88	
4937.977	1806.230		.3657820
4614.270		7001	
22875		3297.660	
19538		13190.60	
6367.469		52393.40	
22488			
75882.69		75882.69	
4937.977	2131.950		.4317450
5365.539		7840	
25582		3297.660	
21706		13190.60	
10741.10		62242.30	
23176			
86570.50		86570.56	
4937.977	2462.220		.4986290
6303.098		8776	
28401		3297.660	
23889		13190.60	
16357.30		73223.06	
23537			
98487.25		98487.25	
4937.977	2745.210		.5559370

```

PRESENT VALUE OF EQUITY= 171471.8
GROWTH IN TOTAL ASSETS(%)= 66.44792
GROWTH IN EPS (PERCENT)= 50.50296
EARNINGS PER SHARE= 1.846930    1.828910    2.158725    2.493145    2.77
9665
RETURN ON EQUITY= .2280893    .2058823    .2034560    .1977931    .18745
53
RETURN ON NET ASSETS= .1412430    .1355627    .1404767    .1422089    .1
393688
DEBT TO EQUITY PER YEAR= .4499983    .3758812    .3147010    .2649043
.2251784
CHANGE IN INTEREST TYPE DEBT=-13274.75    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9811.023    3009.902    3437.855    5124.898    65
53.758
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715    15354    17257    20195    22798
1500    1750    1000    1300    1600
2083.410    1154.180    1154.180    1154.180    1154.180
2614.860    3418.680    4741.438    5939.109    7177.047
8357.359    9031.129    10659.70    12311.10    13726.10
.5000000    .5000000    .5000000    .5000000    .5000000
7972.500    9741.547    11338.70    13823    16249
840.6399    0    298.3738    509.3979    859.2839
5229.727    6837.359    9482.887    11878.20    14354.10
1    2    3    4    5
EQUITY SALES= 3813.800    0    0    0    0
S30 SET= 1    1    1    1    1    1    1    1    1    1
1    1    3    2    1    1    1    1
1
EDIT END

```

COMPUTER RUN A3-2
PRESENT VALUE OF SHAREHOLDERS EQUITY

```

EDIT RUN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
EDIT RUN
INPUT C(2)
? .2
4533.977      6041
19774         3541.930
16105         14167.70
0             35419.30
18757
59170         59170
4805.727      1671.470      .3693860

3814.200      6266
20571         3541.930
17571         14167.70
3695.490      42610
20934
66585.56      66585.69
4805.727      1797.680      .3740700

4610.840      7001
22875         3541.930
19538         14167.70
6301.387      51102.50
22488
75813.19      75813.19
4805.727      2123.130      .4417910

5358.938      7840
25582         3541.930
21706         14167.70
10641.80      60915.10
23176
86464.75      86464.75
4805.727      2453.140      .5104630

6293.180      8776
28401         3541.930
23889         14167.70
16224         71858.56
23537
98344.06      98344.19
4805.727      2735.870      .5692930

```

```

PRESENT VALUE OF EQUITY= 167174.3
GROWTH IN TOTAL ASSETS(%)= 66.20587
GROWTH IN EPS (PERCENT)= 54.11862
EARNINGS PER SHARE= 1.846930    1.870350    2.208955    2.552315    2.8-
6464
RETURN ON EQUITY= .2359548    .2109458    .2077326    .2013573    .1903-
49
RETURN ON NET ASSETS= .1412430    .1349902    .1400238    .1418578    .1
390969
DEBT TO EQUITY PER YEAR= .4999994    .4156214    .3465511    .2907264
.2464512
CHANG IN INTEREST TYPE DEBT=-12053.37    -3.906250E-03    -3.906250E-03    -
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9811.023    2975.711    3402.533    5088.508    6-
16.445
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715    15354    17257    20195    22798
1500    1750    1000    1300    1600
2083.410    1239.680    1239.680    1239.680    1239.680
2614.860    3375.930    4697.328    5893.707    7130.328
8357.359    8988.387    10615.60    12265.70    13679.30
.5000000    .5000000    .5000000    .5000000    .5000000
7972.500    9741.547    11338.70    13823    16249
840.6399    0    295.6389    504.1108    851.3459
5229.727    6751.867    9394.656    11787.40    14260.70
1    2    3    4    5
EQUITY SALES= 2592.450    0    0    0    0
SBU SET= 1    1    1    1    1    1    1    1    1    1
1    1    3    2    1    1    1    1
1
EDIT END

```

COMPUTER RUN A4
THE SBU WHICH GIVE MAXIMUM MARKET SHARE

EDIT RUN
SEEN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3

EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)

?	.2		
4529.348		6015	
19685		3967.980	
16035		15871.90	
0		33066.50	
18672			
58921.30		58921.40	
4563.488	1643.970		.3633090
3772.400		6173	
20271		3967.980	
17453		15871.90	
3734.790		40066.30	
20848			
66079.06		66079.19	
4563.488	1749.970		.3834710
4564.270		6867	
22440		3967.970	
19468		15871.90	
6296.637		48422	
22360			
75128.88		75128.88	
4563.488	2088.920		.4577470
5289.457		7663	
25007		3967.970	
21591		15871.90	
10837		50103.60	
22882			
85606.38		85606.38	
4563.488	2420.390		.5303820

6239.199 8591
 27796 3967.970
 23759 15871.90
 16440.50 68914.75
 23111
 97345.56 97345.56
 4563.488 2702.820 .5922700

PRESENT VALUE OF EQUITY= 158371.4
 MONTH IN TOTAL ASSETS(%)= 65.21281
 MONTH IN EPS (PERCENT)= 63.02098
 EARNINGS PER SHARE= 1.816545 1.917355 2.288734 2.651910 2.96
 1349
 RETURN ON EQUITY= .2485855 .2183843 .2156995 .2082822 .19609
 38
 RETURN ON NET ASSETS= .1395056 .1324149 .1390224 .1413674 .1
 388260
 DEBT TO EQUITY PER YEAR= .5999992 .4951761 .4097283 .3414568
 .2878900
 CHANG IN INTEREST TYPE DEBT=-9923.133 -3.906250E-03 -1.171875E-02 -3
 .906250E-03 -3.906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR=-9815.652 2977.840 3353.714 5265.551 65
 53.242

EDIT END

READY EDIT PR4 BASIC

EDIT RUN

13440	15026	17061	20017	22601	
1500	1750	1000	1300	1600	
2083.410	1388.790	1388.790	1388.790	1388.790	
2477.360	3137.380	4526.367	5729.957	6965.078	
8219.859	8749.828	10444.60	12102	13514.10	
.5000000	.5000000	.5000000	.5000000	.5000000	
7697.500	9413.547	11142.70	13645	16052	
840.6399	0	298.7830	503.7310	866.9590	
4954.727	6274.758	9052.727	11459.90	13930.20	

1	2	3	4	5					
EQUITY SALES= 349.5898	0	0	0	0					
S2U SET= 1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1			

EDIT END

READY EDIT PR6 BASIC

EDIT RUN

SALES PER YEAR= 73651 82087 91328 102290 114239
 GROWTH IN SALES (%)= 55.0854
 EDIT END

COMPUTER RUN A5-1
THE SBU WHICH GIVE MINIMUM MARKET SHARE

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT P3+P3 BASIC
EDIT RUN
INPUT C(2)
? .2
4234.598      5885
18818         3839.410
13820         15357.60
3856.520      31995.10
17068
56997.10      56997.10
4525 1463.520 .3234299

3204.750      5047
16355         3839.410
11836         15357.60
9736.668      32176.40
15288
56420.40      56420.40
4525 45.32280 1.001610E-02

3751.970      4886
15860         3839.410
11923         15357.60
13462.80      34661.70
13747
58744.80      58744.80
4525 621.3379 .1373120

4156.777      4887
15842         3839.410
12263         15357.60
17539.40      38414.10
12697
62490.20      62490.20
4525 938.0969 .2073140

4544.238      4736
15362         3839.410
12541         15357.60
23517.30      43468.50
11437
67401.38      67401.50
4525 1263.600 .2792480

```

```

PRESENT VALUE OF EQUITY= 118517.4
GROWTH IN TOTAL ASSETS(%)= 18.25398
GROWTH IN EPS (PERCENT)=-13.66047
EARNINGS PER SHARE= 1.617149    5.008049E-02    .6865600    1.036570    1
.396239
RETURN ON EQUITY= .2287101    7.042866E-03    8.962893E-02    .1221032
.1453466
RETURN ON NET ASSETS= .1283854    4.016526E-03    5.288451E-02    7.504988
E-02    9.373695E-02
DEBT TO EQUITY PER YEAR= .5999982    .5966175    .5538391    .4997385
.4416302
CHANG IN INTEREST TYPE DEBT=-10566    -3.906250E-03    -3.906250E-03    -3.90
6250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-6253.883    4850.297    4273.348    4481.406    63
65.359
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
12378    3756    6492    8319    10196
1500    1750    1000    1300    1600
2083.410    1343.790    1343.790    1343.790    1343.790
2317.610    744.1138    1820.440    2061.740    2337.370
7317.689    226.6140    3106.690    4690.488    6317.988
.5000000    .5000000    .5000000    .5000000    .5000000
7378    4273.500    5205.750    5690.250    6215.379
840.6399    308.5210    778.9329    1077.030    1403.150
4635.227    1488.230    3640.890    4123.477    4674.727
1    2    3    4    5
EQUITY SALES= 0    0    0    0    0
SBU SET= 3    3    3    3    3    3    3    3    3    3
3    3    2    3    3    3    3
3
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
WE HAVE HAD TROUBLE RECEIVING. PLEASE REENTER YOUR LAST LINE
EDIT RUN
SALES PER YEAR= 67655    55617    54962    56506    57996
GROWTH IN SALES (%)=-14.27685
EDIT END

```

COMPUTER RUN A5-2
THE SBU WHICH GIVE MEDIUM MARKET SHARE

CPL COMP 1		
CPL COMP 2		
CPL COMP 3		
CPL COMP 4		
CPL COMP 5		
EDIT RUN		
INPUT C(2)		
?	.2	
4448.887		5736
18609		3915.610
15372		15662.40
2136.220		32630.10
17378		
57944.10		57944.10
4525	1622.270	.3585130
3610.920		5784
18771		3915.610
15202		15662.40
8477.387		39467.20
18768		
64829.30		64829.30
4525	1709.290	.3777429
4419.227		6145
19933		3915.610
15782		15662.40
13759.30		47053.60
18883		
72776.50		72776.56
4525	1896.580	.4191350
5208.930		6638
21554		3915.610
16776		15662.40
18396.20		55151.10
19432		
81367.06		81367.06
4525	2024.390	.4473780
5978.117		7223
23441		3915.610
17944		15662.40
22937.10		63675.10
20176		
90476.06		90476.06
4525	2131.010	.4709409

```

PRESENT VALUE OF EQUITY= 152346
GROWTH IN TOTAL ASSETS(%)= 56.14366
GROWTH IN EPS (PERCENT)= 31.35948
EARNINGS PER SHARE= 1.792564    1.888715    2.095675    2.236890    2.35
4705
RETURN ON EQUITY= .2485850    .2165456    .2015340    .1835312    .16733
47
RETURN ON NET ASSETS= .1399858    .1318300    .1303017    .1243986    .1
177665
DEBT TO EQUITY PER YEAR= .5999984    .4960577    .4160789    .3549885
.3074672
CHANGE IN INTEREST TYPE DEBT=-10184.99    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-7759.895    5503.195    6090.215    5426.605    53
10.086
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13223    14430    15115    16313    17359
1500    1750    1000    1300    1600
2083.410    1370.460    1370.460    1370.460    1370.460
2368.860    2933.990    3939.800    4621.359    5205.199
8111.359    8546.438    9482.930    10121.90    10655
.5000000    .5000000    .5000000    .5000000    .5000000
7480.500    8817.547    9571.879    10812.40    11909.20
840.6399    170.8970    678.1909    1100.750    1471.700
4737.727    5867.977    7879.598    9242.707    10410.40
1    2    3    4    5
EQUITY SALES= 0    0    0    0    0
SBU SET= 2    2    2    2    2    2    2    2    2    2
2    2    3    2    2    2    2    2
2
EDIT END
READY EDIT E+PR6 BASIC
EDIT RUN
SALES PER YEAR= 71730    76291    79567    84670    90461
GROWTH IN SALES (%)= 26.11313
EDIT END

```

COMPUTER RUN A6
WITH ONLY SBU NO. 18 OPTION 1

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3

EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)

?	.2	
4852.699		1960
6500		3822.680
7400		15290.70
23977.40		31855.70
10199		
52929.10		52929.10
4525	1428.680	.3157290

3827.740		2000
6700		3822.680
7600		15290.70
29829.60		37362
10518		
58475.40		58475.40
4525	1376.570	.3042139

4532.957		2200
7300		3822.680
8200		15290.70
33929.10		43648.60
11000		
64962		64962.10
4525	1571.670	.3473300

5062.906		2400
7900		3822.680
8800		15290.70
38998.50		50548
11300		
72061.25		72061.38
4525	1724.840	.3811800

5679.840		2700
8450		3822.680
9350		15290.70
44514		57680.40
11500		
79493.75		79493.75
4525	1783.090	.3940540

```

PRESENT VALUE OF EQUITY= 142229.7
GROWTH IN TOTAL ASSETS(%)= 50.18910
GROWTH IN EPS (PERCENT)= 24.80754
EARNINGS PER SHARE= 1.578645    1.521070    1.736650    1.905900    1.97
0269
RETURN ON EQUITY= .2242425    .1842206    .1800367    .1706141    .15456
63
RETURN ON NET ASSETS= .1349617    .1177050    .1209684    .1196787    .1
121528
DEBT TO EQUITY PER YEAR= .5999987    .5115727    .4378921    .3781233
.3313670
CHANG IN INTEREST TYPE DEBT=-10649.62    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR= 14485.10    4827.238    4804.715    5599.352    61
32.434
EDIT END
READY EDIT PR4 BASIC
EDIT LIST 20
00020 MAT GET "EEE",A(25)
EDIT 20 MAT GET "EEE",A(145)
EDIT RUN
  918E    9323    9750    10800    11100
  1500    1750    1000    1300    1600
2083.410    1337.940    1337.940    1337.940    1337.940
1400.880    1270.400    1940.090    2252.190    2366.470
7143.379    6882.840    7858.340    8624.188    8915.469
.5000000    .5000000    .5000000    .5000000    .5000000
3445.500    3710.550    3831.750    4428    4551
2939.680    1918.190    2386.370    2714.330    3119.880
2601.770    2540.810    3680.180    4504.379    4732.930
  1      2      3      4      5
EQUITY SALES= 0      0      0      0      0
SBU SET= 0      0      0      0      0      0      0      0      0      0
  0      0      0      0      0      1      0
0
EDIT RUN
SALES PER YEAR= 38291    31303    35100    35800    38200
GROWTH IN SALES (%)= 26.10297
EDIT END

```

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT PR3 BASICA_
EDIT RUN
INPUT C(2)
? .2
3248.700 4081
13274 3222.560
8705 12890.20
13262.80 26854.70
8558
47048.50 47048.50
4525 178.4230 3.943050E-02

3500.290 4266
13871 3222.560
9971 12890.20
11160.90 28540.30
10416
48919.10 48919.10
4525 421.4119 9.312975E-02

3679.540 4801
15575 3222.560
11338 12890.20
9882.379 31049.10
11488
51962.90 51962.90
4525 627.1968 .1386070

3984.450 5440
17682 3222.560
12906 12890.20
9256.539 34152.20
11876
55705 55705
4525 775.7688 .1714410

4374.648 6076
19951 3222.560
14539 12890.20
9323.629 38036.40
12037
60225.30 60225.20
4525 971.0618 .2145990

```

PRESENT VALUE OF EQUITY= 103785.3
 GROWTH IN TOTAL ASSETS(%)= 28.00674
 GROWTH IN EPS (PERCENT)= 444.2456
 EARNINGS PER SHARE= .1971525 .4656488 .6930348 .8572048 1.07
 2994
 RETURN ON EQUITY= 3.322008E-02 7.382751E-02 .1010008 .1135752
 .1276490
 RETURN ON NET ASSETS= 1.896160E-02 4.307234E-02 6.035045E-02 6.963
 187E-02 8.061910E-02
 DEBT TO EQUITY PER YEAR= .5999977 .5645617 .5189444 .4717926
 .4236141
 CHANGE IN INTEREST TYPE DEBT=-13650.24 -3.906250E-03 -3.906250E-03 -3
 .906250E-03 -3.906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR= 2166.496 -1850.313 -1099.273 -320.9336 45
 7.2852
 EDIT END
 EDIT RUN

4527	6031	7507	9395	11698	
1500	1750	1000	1300	1600	
2083.410	1127.900	1127.900	1127.900	1127.900	
892.1150	2107.060	3135.980	3878.850	4855.309	
892.1150	2107.060	3135.980	3878.850	4855.309	
.5000000	.5000000	.5000000	.5000000	.5000000	
4527	6031	7507	9395	11698	
840.6399	1061.020	892.8679	790.5898	740.5229	
1784.230	4214.129	6271.969	7757.688	9710.617	
1	2	3	4	5	

EQUITY SALES= 0 0 0 0 0
 SBU SET= 1 1 1 1 1 1 1 1 1 1
 1 1 3 2 1 1 0 1
 EDIT RUN
 SALES PER YEAR= 44135 51619 58941 67025 76572
 GROWTH IN SALES (%)= 73.49490

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
EDIT RUN
INPUT C(2)
? .2
4602.297      6041
19610         3939.230
15905         15756.90
891.7109      32826.90
17555
58564         58564
4525      1671.470      .3693860

3773.370      6266
20371         3939.220
16471         15756.90
5222.277      39990.50
20115
65952.56      65952.56
4525      1790.910      .3957800

4562.520      6926
22484         3939.220
17919         15756.90
6275.566      48079
21460
74701.06      74701.06
4525      2022.120      .4468769

5321.750      7740
25163         3939.220
19779         15756.90
11829.10      56959.70
22303
84395.75      84395.75
4525      2220.190      .4906490

6162.199      8576
28072         3939.220
21721         15756.90
16083.50      66700.69
22934
94972.69      94972.75
4525      2435.240      .5381750

```

```

PRESENT VALUE OF EQUITY= 156125.4
GROWTH IN TOTAL ASSETS(%)= 62.16898
GROWTH IN EPS (PERCENT)= 45.69444
EARNINGS PER SHARE= 1.846930    1.978899    2.234385    2.453244    2.69
8875
RETURN ON EQUITY= .2545885    .2239169    .2102914    .1948913    .18254
99
RETURN ON NET ASSETS= .1427045    .1357726    .1353474    .1315345    .1
282074
DEBT TO EQUITY PER YEAR= .5999995    .4925199    .4096615    .3457904
.2952911
CHANG IN INTEREST TYPE DEBT=-10066.88    -1.171875E-02    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-8850.992    3501.637    3842.438    4312.762    50
94.852
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715    15354    16639    18718    20935
1500    1750    1000    1300    1600
2083.410    1378.730    1378.730    1378.730    1378.730
2614.860    3342.080    4567.457    5600.367    6726.379
8357.359    8954.527    10110.60    11100.90    12176.20
.5000000    .5000000    .5000000    .5000000    .5000000
7972.500    9741.547    11095.90    13217.40    15485.20
840.6399    71.33690    417.7820    662.0449    946.3250
5229.727    6684.156    9134.930    11200.70    13452.80
1    2    3    4    5
EQUITY SALES= 0    0    0    0    0
SZU SET= 1    1    1    1    1    1    1    1    1    1    1
1    1    3    2    1    1    2    1
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 74426    82922    90930    100474    111526
GROWTH IN SALES (%)= 42.84007
EDIT END

```

COMPUTER RUN A7-3
WITH SBU NO. 18 OPTION 3

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4268.699          5871
19874             3846.560
13185             15386.20
3152.800          32054.70
17558
57158.50          57158.50
4525      1478.420      .3267230

6868.789          5656
18371             3921.900
13771             15687.60
0                32791.30
19046
58056.80          58056.70
4525      184.1430      4.069460E-02

3571.300          6221
20175             3921.900
15538             15687.60
3150.870          36182.70
19578
62013.10          62013.20
4525      847.8579      .1873720

4293.879          6800
22282             3921.890
17506             15687.60
4487.977          41706.40
19606
68175.75          68175.75
4525      1380.920      .3051749

4867.789          7496
24551             3921.890
19639             15687.60
8190.629          49479.90
19337
76585.38          76585.38
4525      1943.400      .4294810

```

```

PRESENT VALUE OF EQUITY= 124905.3
GROWTH IN TOTAL ASSETS(%)= 33.98770
GROWTH IN EPS (PERCENT)= 31.45103
EARNINGS PER SHARE= 1.633615      .2034730      .9368598      1.525074      2.14
7405
RETURN ON EQUITY= .2306090      2.807803E-02      .1171634      .1655526      .19
63020
RETURN ON NET ASSETS= .1293263      1.585887E-02      6.836116E-02      .1012765
.1268790
DEBT TO EQUITY PER YEAR= .5999981      .5980091      .5419578      .4701793
.3963121
CHANG IN INTEREST TYPE DEBT=-10153.52      376.7344      -3.906250E-03      -1.56
2500E-02      -3.906250E-03      -3.906250E-03
CHANGE IN CASH 2Y YR=-6923.504      -552.7100      -146.6211      2059.685      42
76.563
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
12527      5203      9565      13601      18067
1500      1750      1000      1300      1600
2083.410      1346.300      1372.660      1372.660      1372.660
2392.110      1438.210      2953.040      4275.816      5736.367
7392.109      920.7148      4239.289      6904.578      9717
.5000000      .5000000      .5000000      .5000000      .5000000
7527      5720.500      8278.750      10972.30      14036.40
840.6399      252.2240      0      252.0690      359.0388
4784.227      2876.430      5906.090      8551.648      11472.70
1      2      3      4      5
EQUITY SALES= 0      0      0      0      0
SBU SET= 1      1      1      1      1      1      1      1      1      1
1      1      3      2      1      1      3      1
1
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 68582      66228      75200      85823      98057
GROWTH IN SALES (%)= 42.97771
EDIT END

```

COMPUTER RUN B1
FOR GROWTH IN EARNINGS PER SHARE

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4521.930      6044
19770        3982.950
16097        15931.80
0            33191.20
18761
59149.90      59150
4579.777      1638.570      .3621150

3801.500      6243
20489         3982.950
17526         15931.80
3735.630      40303.40
20909
66461.06      66461.06
4579.777      1778.040      .3882370

4578.258      6921
22616         3982.950
19431         15931.80
6722.047      48802.60
22291
75638.25      75638.25
4579.777      2124.810      .4639550

5311.898      7662
25013         3982.940
21384         15931.80
11748.40      58584.50
22704
86161.25      86161.25
4579.777      2445.470      .5339720

6254.727      8480
27459         3982.940
23340         15931.80
17909.80      69476.75
22908
97871.38      97871.50
4579.777      2723.080      .5945880

```

```

PRESENT VALUE OF EQUITY= 159463.8
GROWTH IN TOTAL ASSETS(%)= 65.46326
GROWTH IN EPS (PERCENT)= 64.19858
EARNINGS PER SHARE= 1.810575    1.941185    2.319775    2.669860    2.97
2939
RETURN ON EQUITY= .2468380    .2205819    .2176944    .2087131    .19597
06
RETURN ON NET ASSETS= .1385099    .1337655    .1404586    .1419124    .1
391152
DEBT TO EQUITY PER YEAR= .6000000    .4941207    .4080673    .3399318
.2866388
CHANG IN INTEREST TYPE DEBT=-9848.266    -3.906250E-03    -3.906250E-03    -1
.562500E-02    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9823.070    3015.199    3763.175    5759.992    71
04.227
EDIT EDIT
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13386 15312 17425 20239 22736
1500 1750 1000 1300 1600
2083.410 1394.030 1394.030 1394.030 1394.030
2450.360 3277.760 4705.758 5855.359 7066.418
8192.859 8890.207 10624.10 12227.40 13615.40
.5000000 .5000000 .5000000 .5000000 .5000000
7643.500 9699.547 11506.70 13867 16187
840.6399 0 298.8499 537.7639 939.8718
4900.727 6555.520 9411.520 11710.70 14132.80
1 2 3 4 5
EQUITY SALES= 495.9419 0 0 0 0
SBU SET= 1 2 1 1 1 1 1 1 1 3 1
2 1 2 2 1 1 1 1
1
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 74091 82148 90847 100563 111268
GROWTH IN SALES (%)= 50.17747

```

COMPUTER RUN B2-1
FOR GROWTH IN EARNINGS PER SHARE

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .3
4447.449      6044
19770         3977.360
16097         15909.40
0             33144.70
18761
59075.40      59075.50
4665.137      2457.860      .5431730

3801.500      6243
20489         3977.360
17526         15909.40
2772.770      39368.50
20909
65498.20      65498.30
4665.137      2667.360      .5717640

4481.969      6921
22616         3977.360
19431         15909.40
4766.859      46779.10
22291
73586.75      73586.75
4665.137      3175.960      .6807849

5116.379      7662
25013         3977.360
21384         15909.40
8615.539      55284.10
22704
82832.88      82832.88
4665.137      3645.040      .7813359

5941.449      8480
27459         3977.350
23340         15909.40
13446.20      64727.90
22908
93094.56      93094.56
4665.137      4047.320      .8675680

```

```

PRESENT VALUE OF EQUITY= 153137.9
GROWTH IN TOTAL ASSETS(%)= 57.58600
GROWTH IN EPS (PERCENT)= 59.72223
EARNINGS PER SHARE= 1.810576      1.905880      2.269283      2.604453      2.89
1893
RETURN ON EQUITY= .2471849      .2258456      .2263091      .2197763      .20842
74
RETURN ON NET ASSETS= .1386849      .1357473      .1438647      .1466825      .1
449178
DEBT TO EQUITY PER YEAR= .5999981      .5051439      .4251206      .3597193
.3072361
CHANG IN INTEREST TYPE DEBT=-9876.254      -3.906250E-03      -3.906250E-03      -3
.906250E-03      -1.562500E-02      -3.906250E-03
CHANGE IN CASH BY YR=-9897.551      2126.820      2674.558      4483.090      56
55.730
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13386      15312      17425      20239      22736
1500      1750      1000      1300      1600
2083.410      1392.070      1392.070      1392.070      1392.070
2450.360      3278.730      4668.219      5778.137      6942.078
8192.359      8891.188      10586.50      12150.10      13491.10
.5000000      .5000000      .5000000      .5000000      .5000000
7643.500      9699.547      11506.70      13867      16187
840.6399      0      221.8220      381.3489      689.2429
4900.727      6557.469      9336.438      11556.30      13884.20
1      2      3      4      5
EQUITY SALES= 1268.660      0      0      0      0
SBU SET= 1      2      1      1      1      1      1      1      1      3      1
1      2      1      2      2      1      1      1      1
EDIT END

```

COMPUTER RUN B2-2
FOR GROWTH IN EARNINGS PER SHARE

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT EM
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .1
4596.406      6044
19770         4021.750
16097         16087
442.8909      33514.60
18761
59667.30      59667.30
4525      819.2859      .1810580

3845.790      6243
20489         4021.750
17526         16087
5107.539      41525.60
20909
67877.25      67877.25
4525      890.1128      .1967100

4715.449      6921
22616         4021.750
19431         16087
9106.840      51130.50
22291
78160.25      78160.25
4525      1067.210      .2358479

5550.379      7662
25013         4021.750
21384         16087
15334.30      62214.90
22704
89985.56      89985.56
4525      1231.600      .2721760

6613.316      8480
27459         4021.740
23340         16087
22860.10      74591.69
22908
103180        103180
4525      1375.210      .3039130

```

PRESENT VALUE OF EQUITY= 166818.6
 GROWTH IN TOTAL ASSETS(%)= 72.92546
 GROWTH IN EPS (PERCENT)= 67.85393
 EARNINGS PER SHARE= 1.810580 1.967100 2.358479 2.721760 3.03
 9130
 RETURN ON EQUITY= .2444565 .2143530 .2087229 .1979591 .18436
 52
 RETURN ON NET ASSETS= .1373091 .1311358 .1365413 .1368665 .1
 332826
 DEBT TO EQUITY PER YEAR= .5999997 .4842495 .3932828 .3232144
 .2695841
 CHANGE IN INTEREST TYPE DEBT=-9654.262 0 0 0 -1.171875E-02
 -3.906250E-03
 CHANGE IN CASH BY YR=-9305.703 3914.031 4868.957 7062.387 85
 88.738
 EDIT END
 READY EDIT PR4 BASIC
 EDIT RUN

13386	15312	17425	20239	22736					
1500	1750	1800	1300	1600					
2033.410	1407.610	1407.610	1407.610	1407.610	1407.610				
2450.360	3288.680	4753.840	5943.957	7203.059					
8192.859	8901.129	10672.10	12316	13752.10					
.5000000	.5000000	.5000000	.5000000	.5000000					
7643.500	9699.547	11506.70	13867	16187					
846.6399	35.43120	408.6028	728.5469	1226.740					
4900.727	6577.359	9507.688	11887.90	14406.10					
1	2	3	4	5					

EQUITY SALES= 0 0 0 0 0
 S3U SET= 1 2 1 1 1 1 1 1 3 1
 2 2 1 1 1 1
 1

COMPUTER RUN B3-1
FOR GROWTH IN EARNINGS PER SHARE

CPL COMP 1
CPL COMP 2
CPL COMP 3

CPL COMP 4
CPL COMP 5

0

EDIT END

EDIT RUN

INPUT C(2)

? .2

4521.930	6044	
19776	3540.400	
16097	14161.60	
0	35404	
18761		
59149.90	59150	
4824.207	1638.570	.3621150

3801.500	6243	
20489	3540.400	
17526	14161.60	
3797.560	42573.10	
20909		
66523	66523.06	
4824.207	1793.530	.3717770

4584.449	6921	
22616	3540.400	
19431	14161.60	
6841.797	51141.30	
22291		
75764.19	75764.25	
4824.207	2140.800	.4437610

5323.879	7662	
25013	3540.390	
21384	14161.60	
11928.10	60989	
22704		
86352.88	86352.88	
4824.207	2461.920	.5103260

6272.707	8480	
27459	3540.390	
23340	14161.60	
18151.20	71948.88	
22908		
98130.88	98130.88	
4824.207	2740.010	.5679710

```

PRESENT VALUE OF EQUITY= 167249.6
GROWTH IN TOTAL ASSETS(%)= 65.90195
GROWTH IN EPS (PERCENT)= 56.84814
EARNINGS PER SHARE= 1.810575      1.858885      2.218804      2.551629      2.83
9854
RETURN ON EQUITY= .2314103      .2106165      .2093025      .2018331      .19041
37
RETURN ON NET ASSETS= .1385099      .1348053      .1412804      .1425500      .1
396100
DEBT TO EQUITY PER YEAR= .4999999      .4157535      .3461390      .2902488
.2480356
CHANGE IN INTEREST TYPE DEBT=-12061.02      -3.906250E-03      -3.906250E-03      -1
.562500E-02      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9823.070      3077.129      3827.186      5825.730      71
71.930
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13386      15312      17425      20239      22736
1500      1750      1000      1300      1600
2033.410      1239.140      1239.140      1239.140      1239.140
2450.360      3355.200      4785.680      5937.598      7151.047
8192.859      8967.656      10704      12309.60      13700.10
.5000000      .5000000      .5000000      .5000000      .5000000
7643.500      9699.547      11506.70      13867      16187
840.6399      0      303.8049      547.3440      954.2488
4900.727      6710.406      9571.359      11875.20      14302.10
1      2      3      4      5
EQUITY SALES= 2708.690      0      0      0      0
S2U SET= 1      2      1      1      1      1      1      1      1      3      1
1      2      1      2      2      1      1      1      1
EDIT END

```

COMPUTER RUN B3-2
FOR GROWTH IN EARNINGS PER SHARE

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 U+BASIC
EDIT RUN
INPUT C(2)
? .2
4521.930      6044
19770         3296.230
16097         13184.90
0             36624.80
18761
59149.90      59150
4959.059      1638.570      .3621150

3801.500      6243
20489         3296.230
17526         13184.90
3831.750      43833.10
20909
66557.19      66557.25
4959.059      1802.080      .3633910

4587.867      6921
22616         3296.230
19431         13184.90
6907.816      52431.60
22291
75833.56      75833.69
4959.059      2149.620      .4334720

5338.477      7662
25013         3296.230
21384         13184.90
12027.20      62315.50
22704
86458.56      86458.69
4959.059      2470.990      .4982790

6282.617      8480
27459         3296.230
23340         13184.90
18284.40      73312.88
22908
98273.88      98274
4959.059      2749.350      .5544100

```

```

PRESENT VALUE OF EQUITY= 171545.1
GROWTH IN TOTAL ASSETS(%)= 66.14369
GROWTH IN EPS (PERCENT)= 53.10326
EARNINGS PER SHARE= 1.810575    1.816955    2.167359    2.491395    2.77
2050
RETURN ON EQUITY= .2236968    .2055616    .2049928    .1982645    .18750
80
RETURN ON NET ASSETS= .1385099    .1353783    .1417328    .1429002    .1
398820
DEBT TO EQUITY PER YEAR= .4499990    .3759972    .3143357    .2644787
.2248053
CHANGE IN INTEREST TYPE DEBT=-13281.88    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9823.070    3111.320    3862.434    5861.992    72
09.340
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13386    15312    17425    20239    22736
1500    1750    1000    1300    1600
2083.410    1153.680    1153.680    1153.680    1153.680
2450.360    3397.930    4829.777    5982.969    7197.750
8192.859    9010.379    10748.10    12355    13746.80
.5000000    .5000000    .5000000    .5000000    .5000000
7643.500    9699.547    11506.70    13867    16187
840.6399    0    306.5398    552.6250    962.1768
4900.727    6795.859    9659.547    11965.90    14395.50
1    2    3    4    5
EQUITY SALES= 3929.520    0    0    0    0
S3U SET= 1    2    1    1    1    1    1    1    1    3    1
1    2    1    2    2    1    1    1    1

```

COMPUTER RUN E1
FOR GROWTH IN SALES

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4524.059      6039
19760        3986.030
16085        15944.10
0            33216.90
18817
59186.10      59186.10
4572.680      1659.670      .3667780

3811.200      6261
20556        3986.030
17556        15944.10
3548.180      40280.20
21000
66471.25      66471.38
4572.680      1765.830      .3861700

4594.609      7001
22875        3986.030
19523        15944.10
6083         48695.50
22551
75626.56      75626.56
4572.680      2103.800      .4600810

5340.598      7849
25612        3986.030
21711        15944.10
10324.60      58423.10
23219
86207.06      86207.19
4572.680      2433.150      .5321070

6269.949      8791
28451        3986.020
23924        15944.10
15798.80      69287.56
23565
98008.69      98008.69
4572.680      2714.890      .5937189

```

```

PRESENT VALUE OF EQUITY= 159214.7
GROWTH IN TOTAL ASSETS(%)= 65.59410
GROWTH IN EPS (PERCENT)= 61.87419
EARNINGS PER SHARE= 1.833889    1.930849    2.300405    2.660535    2.96
8595
RETURN ON EQUITY= .2498232    .2191933    .2160159    .2082174    .19591
47
RETURN ON NET ASSETS= .1402077    .1328266    .1390913    .1411224    .1
385025
DEBT TO EQUITY PER YEAR= .5999995    .4947871    .4092806    .3411051
.2676435
CHANG IN INTEREST TYPE DEBT=-9832.883    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -1.171875E-02    -3.906250E-03
CHANGE IN CASH BY YR=-9820.941    2835.320    3318.226    4987.586    64
03.551
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13597    15191    17231    20168    22769
1500    1750    1000    1300    1600
2083.410    1395.110    1395.110    1395.110    1395.110
2555.860    3216.720    4600.719    5793.758    7025.430
8298.359    8829.168    10519    12165.80    13574.40
.5000000    .5000000    .5000000    .5000000    .5000000
7854.500    9578.547    11312.70    13796    16223
840.6399    0    283.8538    486.6399    825.9668
5111.727    6433.430    9201.438    11587.50    14050.90
1    2    3    4    5
EQUITY SALES= 437.2288    0    0    0    0
SBU SET= 1    1    1    1    1    1    1    1    1    1
1    1    1    2    1    1    1    1
1
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 74141    82802    92031    102975    114992
GROWTH IN SALES (%)= 55.09900

```

COMPUTER RUN E2-1
FOR GROWTH IN SALES

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5

0

EDIT END
READY EDIT PR3 BASIC

EDIT RUN
INPUT C(2)

? .3

4448.617	6039
19760	3980.370
16085	15921.50
0	33169.80
18817	
59110.60	59110.70
4658.039	2489.510 .5501680

3811.200	6261
20556	3980.370
17556	15921.50
2590.560	39350.90
21000	
65513.80	65513.80
4658.039	2649.050 .5687039

4498.848	7001
22875	3980.370
19523	15921.50
4143.090	46688.10
22551	

DON WE HAVE TO BUMP YOU OFF ABOUT 9:30 O.K.

73590.88	73590.88
4658.039	3144.510 .6750709

5146.609	7049
25612	3980.370
21711	15921.50
7212.727	55150.50
23219	
82901.25	82901.25
4658.039	3626.750 .7780990

5958.770	8791
28451	3980.370
23924	15921.50
11360.30	64566.20
23565	
93259	93259
4658.039	4035.280 .8663040

```

PRESENT VALUE OF EQUITY= 152929.8
GROWTH IN TOTAL ASSETS(%)= 57.77034
GROWTH IN EPS (PERCENT)= 57.46173
EARNINGS PER SHARE= 1.833893      1.895679      2.250237      2.595330      2.86
7680
RETURN ON EQUITY= .2501785      .2243956      .2245048      .2192032      .20832
78
RETURN ON NET ASSETS= .1403871      .1347833      .1424320      .1458261      .1
442320
DEBT TO EQUITY PER YEAR= .5999997      .5057538      .4262728      .3608646
.3082397
CHANG IN INTEREST TYPE DEBT=-9861.133      -3.906250E-03      -3.906250E-03      -3
.906250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9896.383      1953.141      2240.175      3717.398      49
59.730
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13597      15191      17231      20168      22769
1500      1750      1000      1300      1600
2083.410      1393.130      1393.130      1393.130      1393.130
2555.860      3217.710      4563.398      5717.156      6901.938
8298.359      8830.156      10481.70      12089.20      13450.90
.5000000      .5000000      .5000000      .5000000      .5000000
7854.500      9578.547      11312.70      13796      16220
840.6399      0      207.2450      331.4468      577.0178
5111.727      6435.406      9126.809      11434.30      13803.90
1      2      3      4      5
EQUITY SALES= 1219.940      0      0      0      0
SBU SET= 1      1      1      1      1      1      1      1      1      1
1      1      1      2      1      1      1      1

```

COMPUTER RUN E2-2
FOR GROWTH IN SALES

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
? .1
4599.500      6039
19760         4033.140
16085         16132.60
552.7148      33609.50
18817
59814.20      59814.20
4525          829.8359      .1833889

3866.470      6261
20556         4033.140
17556         16132.60
5016.483      41568.30
21000
67994.88      67994.88
4525          884.3030      .1954260

4741.449      7001
22875         4033.140
19523         16132.60
8557.109      51080.80
22551
78247.50      78247.50
4525          1056.950      .2335800

5588.008      7849
25612         4033.140
21711         16132.60
13996.40      62111.60
23219
90126.25      90126.25
4525          1225.650      .2708610

6637.129      8791
28451         4033.140
23924         16132.60
20833         74453.38
23565
103410        103410
4525          1371.300      .3030510

```

PRESENT VALUE OF EQUITY= 166772.9
 GROWTH IN TOTAL ASSETS(%)= 72.88531
 GROWTH IN EPS (PERCENT)= 65.25040
 EARNINGS PER SHARE= 1.833890 1.954260 2.335800 2.708611 3.03
 0511
 RETURN ON EQUITY= .2469052 .2127350 .2069175 .1973304 .18418
 25
 RETURN ON NET ASSETS= .1387357 .1300544 .1350778 .1359926 .1
 326081
 DEBT TO EQUITY PER YEAR= .6000010 .4851229 .3947811 .3246694
 .2708505
 CHANG IN INTEREST TYPE DEBT=-9597.266 -3.906250E-03 -3.906250E-03 -3
 .906250E-03 -3.906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR=-9192.785 3730.742 4415.598 6285.848 78
 85.723
 EDIT END
 READY EDIT PR4 BASIC
 EDIT RUN

13597	15191	17231	20168	22769					
1500	1750	1000	1300	1600					
2083.410	1411.600	1411.600	1411.600	1411.600	1411.600				
2555.860	3230.580	4651.207	5884.477	7164.047					
8298.359	8843.027	10569.50	12256.50	13713.10					
.5000000	.5000000	.5000000	.5000000	.5000000	.5000000				
7854.500	9578.547	11312.70	13796	16220					
840.6399	44.21719	401.3188	684.5688	1119.710					
5111.727	6461.156	9302.406	11769	14328.10					
1	2	3	4	5					
EQUITY SALES= 0	0	0	0	0	0	0	0	0	0
SDU SET= 1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1

COMPUTER RUN E3-1
FOR GROWTH IN SALES

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4524.059      6039
19760         3543.140
16085         14172.50
0             35431.40
18817
59186.10      59186.10
4814.180      1659.670      .3667780

38111.200     6261
20556         3543.140
17556         14172.50
3610.180     42556.70
21000
66533.25      66533.38
4814.180      1781.330      .3700179

4600.809      7001
22875         3543.130
19523         14172.50
6202.797     51035.90
22551
75752.56      75752.56
4814.180      2119.800      .4403239

5352.578      7849
25612         3543.130
21711         14172.50
10504.50     60834.40
23219
86399         86399
4814.180      2449.610      .5088320

6287.938      8791
28451         3543.130
23924         14172.50
16040.30     71761.56
23565
98268.19      98268.19
4814.180      2731.830      .5674540

```

```

PRESENT VALUE OF EQUITY= 167006.4
GROWTH IN TOTAL ASSETS(%)= 66.03250
GROWTH IN EPS (PERCENT)= 54.71324
EARNINGS PER SHARE= 1.833389      1.850089      2.201619      2.544160      2.83
7270
RETURN ON EQUITY= .2342089      .2092891      .2076774      .2013342      .19034
03
RETURN ON NET ASSETS= .1402077      .1338676      .1399161      .1417615      .1
389987
DEBT TO EQUITY PER YEAR= .4999982      .4162831      .3471209      .2912107
.2468679
CHANG IN INTEREST TYPE DEBT=-12047.37      -3.906250E-03      -1.171875E-02      -3
.906250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9820.941      2897.320      3382.222      5053.473      64
71.156
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13597      15191      17231      20168      22769
1500      1750      1800      1300      1600
2083.410      1240.100      1240.100      1240.100      1240.100
2555.860      3294.220      4680.707      5876.059      7110.129
8298.359      8906.680      10599      12248.10      13659.10
.5000000      .5000000      .5000000      .5000000      .5000000
7854.500      9578.547      11312.70      13796      16220
840.6399      0      288.8140      496.2239      840.3569
5111.727      6588.449      9361.406      11752.10      14220.30
1      2      3      4      5
EQUITY SALES= 2651.690      0      0      0      0
SBU SET= 1      1      1      1      1      1      1      1      1
1      1      1      2      1      1      1      1
EDIT END

```

COMPUTER RUN E3-2
FOR GROWTH IN SALES

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4524.059      6039
19760      3298.780
16085      13195.10
0      36653.10
18817
59186.10      59186.10
4947.430      1659.670      .3667780

3811.200      6261
20556      3298.780
17556      13195.10
3644.360      43812.70
21000
66567.50      66567.56
4947.430      1789.890      .3617809

4604.227      7001
22875      3298.780
19523      13195.10
6268.879      52327.20
22551
75822.06      75822.06
4947.430      2128.630      .4302490

5359.180      7849
25612      3298.780
21711      13195.10
10603.60      62162
23219
86504.75      86504.75
4947.430      2458.690      .4969640

6297.859      8791
28451      3298.780
23924      13195.10
16173.60      73126.56
23565
98411.38      98411.50
4947.430      2741.170      .5540600

```

```

PRESENT VALUE OF EQUITY= 171305.3
GROWTH IN TOTAL ASSETS(%)= 66.27444
GROWTH IN EPS (PERCENT)= 51.06143
EARNINGS PER SHARE= 1.033889      1.808905      2.151244      2.484819      2.77
0300
RETURN ON EQUITY= .2264025      .2042661      .2033961      .1977647      .18742
64
RETURN ON NET ASSETS= .1402077      .1344417      .1403701      .1421130      .1
392710
DEBT TO EQUITY PER YEAR= .4499995      .3764633      .3152065      .2653369
.2255524
CHANGE IN INTEREST TYPE DEBT=-13269.13      -3.906250E-03      -3.906250E-03      -3
.906250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9820.941      2931.500      3417.542      5089.672      65
08.680
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13597      15191      17231      20168      22769
1500      1750      1000      1300      1600
2093.410      1154.570      1154.570      1154.570      1154.570
2555.860      3336.990      4724.840      5921.457      7156.859
8298.352      8949.438      10643.10      12293.50      13705.90
.5000000      .5000000      .5000000      .5000000      .5000000
7854.500      9576.547      11312.70      13796      16220
840.6399      0      291.5488      501.5098      848.2898
5111.727      6673.969      9449.668      11842.90      14313.70
1      2      3      4      5
EQUITY SALES= 3873.460      0      0      0      0
S2U SET= 1      1      1      1      1      1      1      1      1      1
1      1      1      2      1      1      1      1
1

```

COMPUTER RUN F1
FOR RETURN ON ASSETS EMPLOYED

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4466.098      5771
18718         3922.860
15435         15691.40
1934.630      32690.50
17522
58075.70      58075.80
4525      1637.370      .3618500

3700.360      5959
19376         3922.860
15693         15691.40
7487.699      39673.80
18990
65247         65247.10
4525      1745.820      .3858170

4601.668      6613
21476         3922.860
17053         15691.40
10561         47579.40
20115
73806.56      73806.69
4525      1976.410      .4367760

5372.598      7464
24283         3922.860
18882         15691.40
13549.50      56122.80
21114
83201         83201.06
4525      2135.850      .4720110

6150.137      8295
27176         3922.860
20776         15691.40
17356.50      65316.30
21767
93225.56      93225.56
4525      2298.380      .5079280

```

```

PRESENT VALUE OF EQUITY= 154272.1
GROWTH IN TOTAL ASSETS(%)= 60.52417
GROWTH IN EPS (PERCENT)= 40.36969
EARNINGS PER SHARE= 1.809250    1.929085    2.183880    2.360055    2.53
9639
RETURN ON EQUITY= .2504352    .2200218    .2076960    .1902836    .17594
23
RETURN ON NET ASSETS= .1409686    .1337854    .1338912    .1283548    .1
232698
DEBT TO EQUITY PER YEAR= .5999987    .4943882    .4122427    .3494882
.3002963
CHANGE IN INTEREST TYPE DEBT=-10148.75    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -1.562500E-02    -3.906250E-03
CHANGE IN CASH BY YR=-7944.273    4787.328    3974.605    3759.430    45
84.539
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13374    14814    15995    17686    19423
1500    1750    1000    1300    1600
2083.410    1373    1373    1373    1373
2444.360    3116.660    4338.957    5178.637    6042.078
8186.859    8729.109    9882.059    10679.20    11491.90
.5000000    .5000000    .5000000    .5000000    .5000000
7631.500    9201.547    10451.90    12185.40    13973.20
840.6399    154.7700    599.0159    844.8818    1083.960
4888.727    6233.316    8677.906    10357.30    12084.20
1    2    3    4    5
EQUITY SALES= 0    0    0    0    0
SSU SET= 1    3    1    1    1    2    1    2    1    1    1
1    1    2    2    1    1    2    2
3
EDIT RUN
SALES PER YEAR= 71773    78501    85993    95199    105348
GROWTH IN SALES (%)= 46.77934
EDIT END

```

COMPUTER RUNS FOR THE INVESTIGATION OF
JOINT EFFECTS

```

EDIT RUN
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .3
4458.008      6041
19774      3536.870
16105      14147.50
0      35368.70
18757
59094      59094
4890.738      2507.210      .5540790

3814.200      6266
20971      3536.870
17571      14147.50
2721.300      41661.20
20934
65611.38      65611.50
4890.738      2696.780      .5514050

4513.430      7001
22375      3536.870
19538      14147.50
4336.379      49065.50
23483
73750.75      73750.75
4890.738      3173.260      .6488310

5162.430      7840
25582      3536.870
21706      14147.50
7494.938      57597.10
23176
83121.25      83121.38
4890.738      3656.400      .7476160

5978.488      8776
28401      3536.870
23389      14147.50
11739.90      67085.06
23537
93545.25      93545.38
4890.738      4066.300      .8314289

PRESENT VALUE OF EQUITY= 166803.2
GROWTH IN TOTAL ASSETS(%)= 53.25906
GROWTH IN EPS (PERCENT)= 50.05608
EARNINGS PER SHARE= 1.846930      1.838017      2.162769      2.492053      2.77
1430
RETURN ON EQUITY= .2362928      .2157707      .2155799      .2116079      .20204
70
RETURN ON NET ASSETS= .1414250      .1370078      .1434227      .1466292      .1
449960
DEBT TO EQUITY PER YEAR= .5000005      .4244605      .3604236      .3070357
.2636110
CHANGE IN INTEREST TYPE DEBT=-12078.64      -3.906250E-03      -3.906250E-03      -3
.906250E-03      -1.171975E-02      -3.906250E-03
CHANGE IN CASH BY YR=-9086.992      2077.408      2314.306      3807.559      50
61.020
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715      15354      17257      20195      22798
1500      1750      1000      1300      1600
2083.410      1237.900      1237.900      1237.900      1237.900
2614.860      3376.820      4659.250      5816      7005.340
8357.359      8909.270      10577.60      12188      13554.30
.5000000      .5000000      .5000000      .5000000      .5000000
7972.500      8741.547      11938.70      13623      16249
890.6399      0      217.7400      346.9099      599.7950
5229.727      6753.637      9318.500      11632      14010.70
1      2      3      4      5
EQUITY SALES= 3377.540      0      0      0      0
520 SET= 1      1      1      1      1      1      1      1      1
1      1      3      2      1      1      1      1

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0

EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)

7	3	
4458.008	6041	
19774	3992.950	
16105	13171.80	
0	36588.30	
18757		
59094	59094	
5022.809	2507.210	.5540790

3814.200	6866	
20571	3992.950	
17571	13171.80	
2751.180	48910.70	
20934		
65641.25	65641.38	
5022.809	2709.590	.5394560

4516.406	7001	
22675	3992.950	
19538	13171.80	
4394.008	50345.70	
22488		
73811.38	73811.38	
5022.809	3186.430	.6343910

5165.199	7840	
25582	3992.950	
21706	13171.80	
7581.250	58908.80	
23176		
83213.38	83213.24	
5022.809	3659.900	.7386460

5987.117	8776	
28401	3992.950	
23889	13171.80	
11655.60	68429.06	
23537		
93669.69	93669.75	
5022.809	4050.140	.6123230

PRESENT VALUE OF EQUITY= 145068.4
GROWTH IN TOTAL ASSETS(X)= 5% 50963
GROWTH IN EPS (PERCENT)= 46.60777
EARNINGS PER SHARE= 1.846950 1.798186 2.114636 2.435487 2.70
7744
RETURN ON EQUITY= .2844164 .2104828 .2109700 .2076600 .19875
28
RETURN ON NET ASSETS= .1014250 .1375959 .1438997 .1470076 .1
451960
DEBT TO EQUITY PER YEAR= .4500003 .3836979 .3270338 .2794953
.2406102
CHANGE IN INTEREST TYPE DEBT=-13296.27 -3.906250E-03 -3.906250E-03 -1
562500E-02 -3.906250E-03 -3.906250E-03
CHANGE IN CASH BY YR=-9696.998 2107.371 2345.031 3839.035 10
93466

EDIT END
READY EDIT PR4 BASIC
EDIT RUN

13715	15354	17257	20195	28798	
1500	-1750	1000	1300	1600	
2083.410	1152.530	1152.530	1152.530	1152.530	
2614.860	3419.510	4703.129	5869.988	7051.477	
8357.359	9031.957	10621.40	12723	13600.50	
.5000000	.5000000	.5000000	.5000000	.5000000	
7972.500	9741.547	11336.70	13823	16249	
640.6399	0	224.0940	351.5210	606.5000	
5229.727	6839.020	9406.258	11722	14103	

1	2	3	4	5	
EQUITY SALES= 4597.148	0	0	0	0	
SDU SET= 1	1	1	1	1	1
1	1	3	2	1	1
1				1	1

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
?
3
4458.008      6041
19774         4478.758
16105         17915
1331.920      31991.20
18757         60426
60425.90      2507.210      .5540750
4525
3947.390      6266
20571         4478.750
17571         17915
3841.970      38205.60
20934         66865.25
66845.25      2663.320      .5685780
4525
4625.488      7001
22875         4478.750
19538         17915
5394.098      4525.80
22488         74920.56
74920.50      3137.260      .6933179
4525
5268.207      7840
25582         4478.750
21706         17915
8473.207      53971.70
23176         84205.38
84205.38      3619.640      .7999210
4525
6076.316      8776
28401         4478.738
23889         17915
12638.10      63371.70
22537         94541.38
94541.38      4028.590      .8902970
4525
PRESENT VALUE OF EQUITY= 149006.8
GROWTH IN TOTAL ASSETS(%)= 56.45828
GROWTH IN EPS (PERCENT)= 60.68048
EARNINGS PER SHARE= 1.846930      1.961926      2.311060      2.666403      2.96
7657
RETURN ON EQUITY= .2512396      .2323674      .2297057      .2235518      .21190
27
RETURN ON NET ASSETS= .1383077      .1327705      .1395617      .1432862      .1
420398
DEBT TO EQUITY PER YEAR= .6999974      .5861379      .4918914      .4149165
.3533713
CHANGE IN INTEREST TYPE DEBT=-7369.262      -7.812500E-03      0      0      -1.17
10758.02
CHANGE IN CASH BY YR=-8555.074      1999.432      2230.225      3781.628      49
73
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715      15354      17257      20125      22798
1500      1750      1000      1300      1600
22943.410      1567.560      1567.560      1567.560      1567.560
2614.860      3865.270      4539.238      5593.477      4479.637
6357.359      8477.719      10457.50      12065.50      13428.60
.5000000      .5000000      .5000000      .5000000      .5000000
7978.500      9741.547      11328.70      13823      16249
840.6399      106.5540      307.3569      431.5278      677.8560
5229.727      6530.527      9078.488      11387      13759.30
1      2      3      4      5
EQUITY SALES= 0      0      0      0      0
SBU SET= 1      1      1      1      1      1      1      1      1      1
1      1      3      2      1      1      1      1      1      1
1

```

CPL	COMP	1
CPL	COMP	2
CPL	COMP	3
CPL	COMP	4
CPL	COMP	5

```

0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)

```

4533.977	6041
19774	4595.758
16105	18383
2676.710	32826.90
18757	
61846.70	61846.70
4525	1671.470
	.3693860

4081.870	6266
20571	4595.758
17571	18383
6042.648	39955.70
20934	
69200.38	69200.50
4525	1782.210
	3988580

4845.559	7001
22675	+595.750
19538	18383
8609.020	+8375.80
22488	
78355.56	78355.56
4925	
2105.020	.4651980

5589.699	7840
25582	4595.750
21706	18383
12379.80	58114.70
23176	
88933.38	88933.38
4525	2434.720
	5080599

6516.969	8776
28401	4595.750
23689	18383
18392.90	68982.06
23537	
106737	100737
4525	2716.890
	6004170

PRESENT VALUE OF EQUITY=	156088.9			
GROWTH IN TOTAL ASSETS(%)=	22.08174			
GROWTH IN EPS (PERCENT)=	62.51453			
EARLINGS PER SHARE=	1.04630	1.969290	2.325590	2.690299
RETURN ON EQUITY=	.2545085	.2230233	.2175696	.2094754
RETURN ON NET ASSETS=	.1351301	.1267717	.1343248	.1368845
PERCENT EQUITY PER YEAR=	.6999978	.5751058	.4750051	.3954834
CHANG IN INDEBT TYPE DEBT=	-6784.250	0	-7.812500E-03	0
CHANGE IN CASH BY YP=	-7134.316	2913.829	3330.859	5014.918

```

48.371
EDIT END
READY EDIT PR4 BASIC
EDIT RUN

```

13715	15354	17257	20195	22796
1500	1750	1800	1300	1600
2083,416	1808,520	1608,510	1608,510	1608,510
2614,860	3238,590	4606,797	5801,598	7035,450
5357,352	8911,039	10525,10	12713,60	13564,40
5000,000	5000,000	5000,000	5000,000	5000,000
791,550	915,510	1135,910	1634,910	1634,910
640,6099	214,1370	933,4119	568,7219	1030,3300
5229,727	6997,156	9619,550	11669,20	14070,90

[illegible]

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .1
4609.957      6041
19774         4712.770
16185         18851.10
4021.500      33662.60
18757
63267.40      63267.50
4525          835.7358      .1846938

4216.348      6266
20571         4712.758
17571         18851
8250.020      4712.50
20934
71542.25      71542.25
4525          834.4348      .1976650

5066.297      7001
22875         4712.758
19538         18851
11043.70      51246.20
22488
81810.08      81810.88
4525          1059.290      .2340969

5913.156      7840
20582         4712.750
21706         18851
17327.10      62300.40
23176
93704.19      93704.19
4525          1228.250      .2714370

6961.699      8776
23401         4712.750
63839         18851
24219.10      74663.06
23537
107000        107000
4525          1374.180      .3036870

PRESENT VALUE OF EQUITY= 167251.4
GROWTH IN TOTAL ASSETS(%)= 69.13805
GROWTH IN EPS (PERCENT)= 64.42795
EARNINGS PER SHARE= 1.846930      1.976650      2.340970      2.714371      3.03
6870
RETURN ON EQUITY= .2482684      .2144287      .2067061      .1971498      .18403
86
RETURN ON NET ASSETS= .1320959      .1250228      .1294804      .1310774      .1
234155
DEBT TO EQUITY PER YEAR= .7000014      .5649087      .4598147      .3782279
3155300
CHANGE IN INTEREST TYPE DEBT=-6199.250      -.1093758      0      -7.812500E-03
0
CHANGE IN CASH BY YR=-5713.543      3834.910      4443.629      6330.258      79
40.543

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5

0E1D

EDIT END

PENDY EDIT PR3 BASIC

EDIT RUN

INPUT C(2)

?	1		
4609.937		6841	
19774		3302.380	
16185		13209.50	
0		36693.10	
18757			
59246		59246	
4853.156	835.7358		.1046930
3814.200		6266	
20571		3302.380	
17571		13209.50	
4707.988		44620.40	
20934			
67598.06		67598.19	
4853.156	903.0308		.1860710
4712.090		7001	
23875		3302.370	
19538		13209.50	
8346.387		54448.60	
22488			
77961.38		77961.38	
4853.156	1069.800		.2204350
5563.637		7840	
25982		3302.370	
21706		13209.50	
13923.30		65599.06	
23176			
89950.88		89950.88	
4853.156	1238.950		.2552879
6621.316		8776	
28401		3302.370	
23089		13209.50	
20905.80		78066.25	
23537			
103354		103354	
4853.156	1305.250		.2654330

PRESENT VALUE OF EQUITY= 177917.9

GROWTH IN TOTAL ASSETS(%)= 74.44887

GROWTH IN EPS (PERCENT)= 54.54454

EARNINGS PER SHARE= 1.846930 1.860710 2.204350 2.552880 2.95

4330

RETURN ON EQUITY= .2277638 .2014778 .1964790 .1888671 .17744

50

RETURN ON NET ASSETS= .1410620 .1335863 .1372218 .1377363 .1

340297

DEBT TO EQUITY PER YEAR= .4499996 .3684003 .3032560 .2517889

.2115109

CHANGE IN INTEREST TYPE DEBT=-13251.13 -3.906250E-03 -1.562500E-02 -3

.906250E-03 -3.906250E-03 -3.906250E-03

CHANGE IN CASH BY YR=-9735.043 3912.230 4538.285 6426.457 80

40.180

EDIT END

PENDY EDIT PR4 BASIC

EDIT RUN

13715	15354	17257	20195	22798				
1500	1750	1000	1300	1600				
2083.410	1155.830	1155.830	1155.830	1155.830	1155.830			
2614.660	3417.860	4779.750	6017.520	7303.500	7303.500			
8357.253	9030.303	10693.10	12389.50	13852.50	13852.50			
.5000000	.5000000	.5000000	.5000000	.5000000	.5000000			
7972.500	9741.047	11338.70	13823	16249				
840.6399	0	376.6399	667.3708	1113.860				
5229.727	6835.707	9559.500	12035	14607				
1	2	3	4	5				
EQUITY SALES= 3030.460	0	0	0	0				
S2U SET= 1	1	1	1	1	1	1	1	1
1	1	3	2	1	1	1	1	1

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .1
4609.957      6041
19774         3547
16105         14188
0             35470
18757
59246         59246
4720.707      835.7358      .1846330
3814.200      6266
20571         3547
17571         14188
4669.488      43558.70
20934
67559.56      67559.69
4720.707      898.7500      .1903840
4760.250      7001
22875         3547
19538         14188
6273.797      53147.10
22488
77882.88      77883
4720.707      1065.370      .2256800
5556.180      7640
25582         3546.990
21706         14188
13811.30      64256.40
23176
99831.30      99831.30
4720.707      1234.370      .2614800
6610.117      8776
28401         3546.990
23089         14188
20754.90      76681.06
23337
103192        103192
4720.707      1380.520      .2924390
PRESENT VALUE OF EQUITY= 173588.2
GROWTH IN TOTAL ASSETS (%)= 74.17545
GROWTH IN EPS (PERCENT)= 58.33793
EARNINGS PER SHARE= 1.846930      1.903840      2.256801      2.614800      2.92
4391
RETURN ON EQUITY= .2356178      .2063369      .2004569      .1921008      .18003
41
RETURN ON NET ASSETS= .1410620      .1330308      .1367913      .1374097      .1
337817
DEBT TO EQUITY PER YEAR= .5000000      .4071517      .3336965      .2760034
2312025
CHANGE IN INTEREST TYPE DEBT=-12028.01      0      0      -1.171675E-02      -3.90
6250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9735.043      3873.730      4498.355      6385.430      79
97.539
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13715      15354      17257      20195      22756
1500      1750      1900      1500      1800
2083.410      1241.450      1241.450      1241.450      1241.450
2614.860      3375.050      4735.398      5971.727      7256.219
8357.252      8987.500      10653.70      12343.70      13805.20
.5000000      .5000000      .5000000      .5000000      .5000000
7972.500      9741.547      11339.70      13323      15249
840.6399      0      373.5588      661.9038      1104.900
5229.727      6750.093      9470.809      11943.50      14512.40
1      2      3      4      5
EQUITY SALES= 1807.350      0      0      0      0
SBU SET= 1      1      1      1      1      1      1      1      1      1
1      1      3      2      1      1      1      1

```

```

CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
0
EDIT END
READY EDIT PRG BASIC
EDIT RUN
INPUT C(2)
  1
  1
  4609.557      6041
  19774      3040.280
  16105      12161.10
  0      38003.50
  18757
  59246      59246
  4995.066      835.7358      .1846930
  3814.200      6266
  20571      3040.280
  17571      12161.10
  4749.297      46172.10
  20934
  57639.38      67639.50
  4995.066      907.6169      .1817030
  4716.227      7001
  22875      3040.280
  19538      12161.10
  9429.316      55343.10
  22488
  78045.50      70045.50
  4995.066      1074.560      .2151240
  5071.629      7840
  25532      3040.280
  21706      12161.10
  14043.60      67037.75
  23176
  90079.19      90079.19
  4995.066      1243.860      .2490169
  6633.348      8776
  29401      3040.280
  23889      12161.10
  21067.70      79550.56
  23527
  103528      103528
  4995.066      1990.320      .2783360
PRESENT VALUE OF EQUITY= 182556.8
GROWTH IN TOTAL ASSETS(1)= 74.74251
GROWTH IN EPS (PERCENT)= 50.70305
EARNINGS PER SHARE= 1.846930      1.817030      2.151239      2.490170      2.78
3381
RETURN ON EQUITY= .2199103      .1965727      .1924250      .1855463      .17477
19
RETURN ON NET ASSETS= .1410620      .1341048      .1376638      .1380852      .1
342942
DEBT TO EQUITY PER YEAR= .3999993      .3292329      .2722158      .2267564
19
CHANGE IN INTEREST TYPE DEBT=-14561.63      -3.906250E-03      -3.906250E-03      -3
.706250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9795.043      5953.539      4581.043      6470.684      80
85.820
EDIT END
READY EDIT PRG BASIC
EDIT RUN
  13715      15254      17257      20195      22798
  1500      1750      1000      1300      1600
  2083.410      1064.100      1064.100      1064.100      1064.100
  2614.060      3463.720      4827.270      6066.578      7354.128
  8357.259      9076.180      10745.60      12438.60      13903.20
  .5000000      .5000000      .5000000      .5000000      .5000000
  7972.500      9741.547      11338.70      13023      16249
  640.6399      0      379.9438      674.2659      1123.490
  5229.727      6927.449      9654.539      12133.26      14708.40
  1      2      3      4      5
EQUITY SALES= 4340.918      0      0      0      0
SDU SET= 1      1      1      1      1      1      1      1      1      1
  1      1      3      2      1      1      1      1
1.1.1

```

COMPUTER RUN J9

```

CPL COMP 1
-2621.301
INPUT NEW K AND V(K)
? 1.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 7264.273 1
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .1
4690.699 5251
17204 2217.130
14322 8868.500
0 36952.10
17072
53288.70 53288.80
4882.270 834.9778 .1845250

7046.738 6266
20571 2762.620
17571 11050.50
0 46043.60
20934
66122.69 66122.69
5001.578 889.4219 .1821740

4241.297 7001
22875 2762.620
19538 11050.50
6877.078 55205.30
22488
76019.25 76019.38
5001.578 1017.970 .2035289

5416.500 7840
25582 2762.620
21706 11050.50
11624.50, 65851.88
23176
87505 87505
5001.578 1188.960 .2365180

```

6391.449	8776	
28401	2762.610	
23889	11050.50	
18028.80	77658.06	
23537		
100247	100247	
5001.578	1311.800	.2622769

PRESENT VALUE OF EQUITY= 179507.1
 GROWTH IN TOTAL ASSETS(%)= 88.12054
 GROWTH IN EPS (PERCENT)= 42.13628
 EARNINGS PER SHARE= 1.845250 1.821740 2.035290 2.365180 2.62
 2770
 RETURN ON EQUITY= .2259623 .1931697 .1843972 .1796396 .16892
 30
 RETURN ON NET ASSETS= .1566895 .1345109 .1339095 .1351877 .1
 308568
 DEBT TO EQUITY PER YEAR= .3000000 .3000008 .2502136 .2097604
 .1778709
 CHANGE IN INTEREST TYPE DEBT=-15949.89 2727.484 -3.906250E-03 -3.90
 6250E-03 -1.171875E-02 -3.906250E-03
 CHANGE IN CASH BY YR=-9654.301 2356.039 4071.637 5922.625 73
 79.246

EDIT END

READY EDIT PR4 BASIC

EDIT RUN

13280	14702	16408	19004	21324	
1500	1750	1000	1300	1600	
2083.410	775.9939	966.9158	966.9148	966.9148	
2607.280	3281.780	4261.406	5457.617	6569.020	
8349.777	8894.227	10179.70	11829.60	13118	
.5000000	.5000000	.5000000	.5000000	.5000000	
7537.500	9089.547	10489.80	12632	14775	
1260.480	0	550.1658	929.9609		
5214.566	6563.547	8522.828	10915.20	13138	
1	2	3	4	5	
EQUITY SALES= 3296.320		1086.730	0	0	0
SEU SET= 0	1	1	1	1	1
1	1	3	2	1	1
1					

COMPUTER RUN J10

```

-----
CPL COMP 1
-1260.902
INPUT NEW K AND V(K)
  ? 10.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 3.0
EXCESS
TOOFEW3.0
EXCESS1
  ? 3.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 1
  ? 14.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 0
BEEN TO MP3 5903.875 1
CPL COMP 1
-851.4844
INPUT NEW K AND V(K)
  ? 20.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 16.0
  ? 1
  ? 16.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 1.0
EXCESS1
  ? 9.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 0
BEEN TO MP3 5397.844 1
CPL COMP 1
-39.52344
INPUT NEW K AND V(K)
  ? 9.1
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 1
  ? 8.0
ANOTHER CHANGE ENTER 1 OTHERWISE
  ? 0
BEEN TO MP3 4579.098 1
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END

```

READY EDIT PR3 BASIC

EDIT RUN

INPUT C(2)

?	.3	
4457.840		5602
18338		2875.710
15118		11502.80
0		35946.30
18013		
55926.80		55926.90
5012.066	2375.690	.5250150

7348		6266
20571		3437.600
17571		13750.40
0		42970
20934		
66424		66424
5129.199	2579.540	.5146660

4241.297		7001
22675		3437.600
19538		13750.40
4952.326		49905.60
22488		
74094.56		74094.56
5129.199	2972.410	.5795079

5224.027		7840
25582		3437.600
21706		13750.40
7297.359		57957.40
23176		
52985.25		82285.38
5129.199	3450.750	.6727660

5956.727		8776
28401		3437.600
23889		13750.40
11013.60		66835.25
23537		
92799.25		92799.25
5129.199	3804.840	.7418000

PRESENT VALUE OF EQUITY= 162929.3

GROWTH IN TOTAL ASSETS(2)= 65.92979

GROWTH IN EPS (PERCENT)= 41.29123

EARNINGS PER SHARE= 1.750050 1.715553 1.931693 2.242553 2.47

2.667

RETURN ON EQUITY= .2203000 .2001039 .1985355 .1984648 .18976

22

```

RETURN ON NET ASSETS= .1415952      .1294482      .1337215      .1386090      .1
366692
DEBT TO EQUITY PER YEAR= .3999996      .3999999      .3444102      .2965626.
.2571696
CHANGE IN INTEREST TYPE DEBT=-12575.00      2809.488      -3.906250E-03      -3.9
6250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9887.160      2890.160      1845.625      3327.762      44
50.938
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? -
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
12620      14341      16101      18740      21036
1500      1750      1000      1300      1600
2083.410      1006.500      1203.160      1203.160      1203.160
2176.480      2086.020      3989.790      5130.508      6133.809
7918.977      8596.477      9906.039      11502.50      12682.80
.5000000      .5000000      .5000000      .5000000      .5000000
6877.500      8723.547      10182.80      12368      14487
1058.880      0      0      396.1858      583.7888
4352.969      5972.047      7979.590      10261      12267.60
1      2      3      4      5
EQUITY SALES= 4262.047      1004.730      0      0      0
SEU SET= 1      1      0      1      1      1      1      0      1      0      1
1      1      0      2      0      1      1      1
0
EDIT END
READY EDIT PR6 BASIC
EDIT RUN
SALES PER YEAR= 68562      76533      84985      94850      105813
GROWTH IN SALES (%)= 54.33177
EDIT END
READY EDIT PR6 BASIC
EDIT 760 C(2)=.1
EDIT 75_61 C(3)=.3
EDIT LIST 761
00761 C(3)=.3
EDIT RUN
SALES PER YEAR= 68562      76533      84985      94850      105813
GROWTH IN SALES (%)= 54.33177
EDIT END

```

COMPUTER RUN J11

```

CPL COMP 1
-4175.906
INPUT NEW K AND V(K)
? 6.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 1
? 15.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 8818.879 1
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .3
4543.020 5062
16593 2145.880
14041 8583.520
0 35764.70
16379
51556 51556.10
5023.379 2308.390 .5101399

3814.200 6266
20571 2613.420
17571 10453.70
0 43557.10
20934
62890.20 62890.20
5290.438 2420.460 .4318380

4241.297 7001
22875 2613.420
19538 10453.70
1013.700 50087.90
22486
70155.88 70156
5290.438 2798.930 .5290540

```

4830.168	7840
25582	2613.420
21706	10453.70
3263.410	57650.50
23176	
78557.50	78557.56
5290.438	3241.110 .6126350

5555.340	8776
28401	2613.420
23889	10453.70
6451.137	65990.38
23537	
87833.38	87833.38
5290.438	3574.260 .6756060

PRESENT VALUE OF EQUITY= 162739.6
 GROWTH IN TOTAL ASSETS(%)= 70.36494
 GROWTH IN EPS (PERCENT)= 32.43541
 EARNINGS PER SHARE= 1.700466 1.606127 1.763514 2.042116 2.25
 2020
 RETURN ON EQUITY= .2151461 .1852328 .1862679 .1874000 .18054
 46
 RETURN ON NET ASSETS= .1492481 .1282902 .1329862 .1375260 .1
 356454
 DEBT TO EQUITY PER YEAR= .2999997 .2999997 .2608837 .2266609
 .1980155
 CHANG IN INTEREST TYPE DEBT=-16695.88 2337.715 -3.906250E-03 -3.90
 6250E-03 -3.906250E-03 -3.906250E-03
 CHANGE IN CASH BY YR=-9801.980 -728.8196 1440.796 2838.577 39
 12.899

EDIT END

READY EDIT PR4 BASIC

EDIT RUN

11858	13925	14656	17369	19533					
1500	1750	1000	1300	1600					
2083.410	751.0569		914.6980	914.6968	914.6968				
1952.120	2455.740		3411.530	4431.699	5365.180				
7694.617	8068.199		9329.770	10803.70	11914.20				
.5000000	.5000000		.5000000	.5000000	.5000000				
6115.500	7412.547		8737.750	10997	12984				
1372.160	0	0	81.09619	261.0730					
3904.250	4911.488		6823.047	8863.387	10730.40				
1	2	3	4	5					
EQUITY SALES=	4237.430		2144.680	0	0	0			
SDU SET=	1	1	1	0	1	1	1	1	1
1	1	3	0	1	1	1	1		
1									


```

CPL COMP 1
-473.4258
INPUT NEW K AND U(K)
? 16.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 5122.338 1
CPL COMP 1
-253.3672
INPUT NEW K AND U(K)
? 3.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 4866.426 1
CPL COMP 1
-81.33594
INPUT NEW K AND U(K)
? 14.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 4696.242 1
CPL COMP 1
-115.7031
INPUT NEW K AND U(K)
? 12.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 4638.199 1
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT SAVE
EDIT EDIT PRS BASIC
0103 INV CHD
EDIT END
FENDY EDIT PRS BASIC
EDIT RUN
INPUT C(2)
? CL
4561.047 5647
18487 2882.570
19236 11530.30
0 36032.20
17808
56092.10 56092.10
4914.949 1007.160 .3551739
3814.200 6266
20571 2882.570
17571 11530.30
771.0828 42982.40
20934
63661.30 63661.30
4914.949 1737.550 .3535240
4510.406 7001
22875 2882.570
19538 11530.30
3331.600 51137.20
22488
72551 72551.00
4914.949 2038.700 .4147960
5061.957 7840
25562 2882.570
21706 11530.30
7209.207 60542.30
23176
62795.06 62795.06
4914.949 2351.260 .4783900
5955.918 8776
26401 2882.570
23099 11530.30
12410.80 71004.88
23937
54199.56 54199.56
4914.949 2615.660 .5321850

```

```

PRESENT VALUE OF EQUITY= 167374.1
GROWTH IN TOTAL ASSETS(%)= 67.92659
GROWTH IN EPS (PERCENT)= 49.83777
EARNINGS PER SHARE= 1.775869    1.767619    2.073979    2.391950    2.66
0925
RETURN ON EQUITY= .2230172    .2021235    .1993363    .1941832    .18418
88
RETURN ON NET ASSETS= .1432608    .1364683    .1405012    .1419927    .1
388449
DEBT TO EQUITY PER YEAR= .3999995    .3353201    .2818469    .2380627
.2029841
CHANGE IN INTEREST TYPE DEBT=-15350.14    -3.906250E-03    -3.906250E-03    -3
.906250E-03    -3.906250E-03    -3.906250E-03
CHANGE IN CASH BY YR=-9783.953    24.23438    3064.803    4681.074    60
35.551
EDIT END
READY EDIT PR4 BASIC
EDIT MAT GET "EEE",A(25)
0103    INV CMD
EDIT 20 MAT GET "EEE",A(25)
EDIT SAVE
EDIT RUN
12855    14522    16416    19183    21635
1500    1750    1800    1300    1600
2083.410    1008.900    1008.900    1008.900    1008.900
2293.300    3075.320    4275.270    5384.309    6529.316
8035.797    8607.770    10193.50    11756.30    13078.30
.5000000    .5000000    .5000000    .5000000    .5000000
7112.500    8909.547    10497.80    12811    15086
1057.520    0    61.68660    266.5339    581.5369
4586.609    6150.637    8550.527    10768.60    13058.60
1    2    3    4    5
EQUITY SALES= 3462.550    0    0    0    0
SSU SET= 1    1    0    1    1    1    1    1    1    1
0    1    0    2    0    1    1    1
1

```

COMPUTER RUN J13

```

CPL COMP 1
-3398.609
INPUT NEW K AND V(K)
? 5.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 1
? 12.0
ANOTHER CHANGE ENTER 1 OTHERWISE
? 0
BEEN TO MP3 8041.582 1
CPL COMP 1
CPL COMP 2
CPL COMP 3
CPL COMP 4
CPL COMP 5
3
EDIT END
READY EDIT PR3 BASIC
EDIT RUN
INPUT C(2)
? .2
4606.180 5233
17156 2231.090
14615 5924.340
0 37184.80
17196
53573.20 53573.20
4989.590 1681.760 .3716600

6494.637 6266
29571 2737.140
17571 10948.50
0 45619
20934
65570.56 65570.56
5132.938 1787.560 .3582570

4241.297 7001
22875 2737.130
19538 10948.50
5346.578 53802.30
22488
74488.75 74488.88
5132.938 2045.820 .3985680

```

```

5263.449      7840
25582         2737.130
21706         10948.50
9058.688      63260.50
23176
84786.06      84786.06
5132.938      2364.570      .4606659

6134.859      8776
28401         2737.130
23889         10948.50
14170.10      73670.25
23537
96131.88      96131.88
5132.938      2602.470      .5070130

PRESENT VALUE OF EQUITY= 175001.6
GROWTH IN TOTAL ASSETS(%)= 79.44020
GROWTH IN EPS (PERCENT)= 36.41853
EARNINGS PER SHARE= 1.858299      1.791285      1.992840      2.303329      2.53
5065
RETURN ON EQUITY= .2261354      .1959228      .1901239      .1868915      .17662
97
RETURN ON NET ASSETS= .1569591      .1363081      .1373241      .1394433      .1
353593
DEBT TO EQUITY PER YEAR= .2999997      .2999986      .2543688      .2163376
.1457667
CHANGE IN INTEREST TYPE DEBT=-16077.37      2530.207      -1.171875E-02      -3.9
6250E-03      -3.906250E-03      -3.906250E-03
CHANGE IN CASH BY YR=-9738.820      1888.457      3093.235      4734.262      9
82.820
EDIT END
READY EDIT PR4 BASIC
EDIT RUN
13429      14794      16498      19104      21309
1500      1750      1900      1300      1600
2283.410      780.8799      957.9968      957.9968      957.9968
2666.300      3325.330      4310.879      5450.859      6463.340
8408.797      8937.789      10229.10      11822.90      13012.30
.5000000      .5000000      .5000000      .5000000      .5000000
7666.500      9151.547      10579.60      12732      14760
1229.520      0      0      427.7258      724.6943
5332.699      6650.656      8621.750      10901.70      12926.70
1      2      3      4      5
EQUITY SALES= 4316.750      1283.940      0      0      0
SBU SET= 1      1      1      1      1      1      1      1
0      1      3      2      1      1      1      1
1

```

COMPUTER RUNS FOR PROBABILITY
INVESTIGATION

COMPUTER RUN P1

241

```

EDIT RUN
INPUT CORP. TAX RATE .XX
? .50
18835.98 743816.1 15451.17 664209.3 18059.82 1170651
5753.145 68902.94 9456.035 551412.7
0 0 0
19603.45 786316.5 16847.88 726694.2 20096.13 1287141
5969.633 72035.06 10171.35 559094.9
0 0 0
21810.14 939163.4 18736.64 854034.7 21587.29 1424276
6673.707 87131.88 11821.67 680373.4
0 0 0
24382.15 1143051 30831.28 1007396. 22226.78 1517017
7470.996 106927.9 12841.49 749273.4
0 0 0
27056.11 1367349 20810.99 1168433 22564.35 1578292
5362.535 134629.8 14152.88 807726.4
0 0 0
YEAR EXPECTED CASH CHANGE VARIANCE CHANGE
1 32901.21 3198990
2 6187.363 6070058
3 6329.133 6797364
4 2368.660 7683268
5 9929.172 8530849
YEAR EXPECTED PROFIT PROFIT VARIANCE
1 9456.035 551412.7
2 10171.38 559094.9
3 11221.67 620373.4
4 12641.49 749273.4
5 14152.88 807726.4
DONE

```

COMPUTER RUN P2

```

EDIT RUN
INPUT CORP. TAX RATE .XX
? .50
18653.07 1752867 14936.47 2543016 17944.34 1265464
5650.652 232966.1 8564.291 2725727
0 0 0
15511.27 1021813 17090.67 961481.2 20286.42 1491591
5730.992 254926.5 9603.656 1507572
0 0 0
21970.47 3065130 18495.49 1399016 20791.39 3636330
6737.371 113663.6 10965.25 799351.6
0 0 0
24014.43 3641336 20167.25 4159261 22088.54 1557552
7446.598 160901.9 12861.52 3692838
0 0 0
26801.13 2420757 22339.33 3084826 21977.65 2634685
2562.765 203922.9 13784.04 1995006
0 0 0
YEAR EXPECTED CASH CHANGE VARIANCE CHANGE
1 32718.45 8920060
2 4232.727 1.150593E+07
3 7711.336 1.273272E+07
4 8531.609 2.141322E+07
5 9604.737 1.967022E+07
YEAR EXPECTED PROFIT PROFIT VARIANCE
1 8564.891 2725727
2 9603.656 1507572
3 10965.25 799351.6
4 12861.52 3692838
5 13784.04 1995006
DONE
EDIT END

```

COMPUTER RUN P3

EDIT RUN

INPUT CORP. TAX RATE .XX

? .5

SBU 18 LIQUIDATED, INPUT OPTION#0,1,2,3

? 1

SBU 18 LIQUIDATED, INPUT OPTION#0,1,2,3

? 1

SBU 18 LIQUIDATED, INPUT OPTION#0,1,2,3

? 1

12465.98	338200.1	8199.176	138481.3	8064.809	172043.9
3632.347	32023.00	2140.098	16388.73		
21696.21	4705280	0	0		
13037.46	355356.5	9399.879	172366.2	9788.488	225094.6
4009.637	33636.14	2653.017	23687.02		
0	0	0	0		
14656.14	427547.4	10700.64	208514.7	10807.29	262645.3
4517.711	40667.95	3544.237	31157.40		
0	0	0	0		
16640.15	543854.8	12177.29	263939.6	11152.78	291162.6
5119	51630.82	4427.219	41561.35	0	
0	0	0	0		
16775.12	681882.4	13718	329155.3	11294.36	308662
539	64655.80	5504.875	60174.47	0	5716.
0	0	0	0		

YEAR EXPECTED CASH CHANGE VARIANCE CHANGE

1	68977.63	5402416
2	-465.5491	1490888
3	114.0532	1756985
4	1222.367	2131552
5	2285.164	2595144
YEAR	EXPECTED PROFIT	PROFIT VARIANCE
1	2140.098	16388.73
2	2853.017	23687.02
3	3544.237	31157.40
4	4427.219	41561.38
5	5504.875	60174.47

DONE

COMPUTER RUN P4

EDIT RUN

INPUT CORP. TAX RATE .XX

? .50

19774	0	16105	0	18757	0	6041	0	9728.750
0	0	0	0					
20571	0	17571	0	20934	0	6266	0	10483.22
0	0	0	0					
22875	0	19538	0	22488	0	7001	0	11587.63
0	0	0	0					
25582	0	21706	0	23176	0	7840	0	13283.50
0	0	0	0					
28401	0	23889	0	23537	0	8776	0	14673.50
0	0	0	0					

YEAR	EXPECTED CASH CHANGE	VARIANCE CHANGE
------	----------------------	-----------------

1	31172.75	0
2	6268.223	0
3	6497.625	0
4	8559.500	0
5	10246.50	0

YEAR	EXPECTED PROFIT	PROFIT VARIANCE
------	-----------------	-----------------

1	9728.750	0
2	10483.22	0
3	11587.63	0
4	13283.50	0
5	14673.50	0

DONE

EDIT END

COMPUTER RUN
FOR
RESTRICTED OPTIMA

COMPUTER RUN W-1
GUIDE TABLE FOR USE WHEN FINDING RESTRICTED OPTIMA

EDIT	RUN
TABLE	OF W & D
1	4431.066
2	1323.174
3	449.0989
4	1127.954
5	3163.758
6	5299.578
7	763.4993
8	1656.089
9	866.7048
10	326.4563
11	2931.063
12	2166.819
13	931.3831
14	566.1404
15	2903.552
16	666.7217
17	575.2192
18	39810.52
19	1598.464
20	614.6186

APPENDIX D

INPUT DATA

I. LIST OF TABLES FOUND IN APPENDIX D

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Table XXII Corporate Balance Sheet Data	247
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II. DISCUSSION

This appendix contains the input data files used in the research along with the arbitrarily assigned three-point probability distributions used in the probability investigation. The format of Table XXIII is identical to the one in Figure 9. For example, for the first record (Line #10), the SBU contribution is given in data position #8 and is equal to 435.

The format of Table XXIV is similar to that of Table XXIII and is

identical to Figure 11. The format of Table XXV is found in Figure 10 of Appendix A. All lines of Table XXV, except 2, 6 and 10, are calculated by the computer and hence have zero entries initially.

TABLE XXII

CORPORATE BALANCE SHEET DATA ¹
(Thousands of dollars)

Beginning of Year One

<u>Line #</u>	<u>Assets</u>	<u>Line #</u>	<u>Liabilities</u>
1	Cash <u>3837</u>	7	Payables <u>5500</u>
2	Inventories <u>17559</u>	8	Short Term Debt <u>7056</u>
3	Receivables <u>12500</u>	9	Long Term Debt <u>22707</u>
4	Investments <u>10508</u>	10	Shareholder Equity <u>26141</u>
5	Plant, Equipment and Land <u>25000</u>		
6	Accumulated Depreciation <u>8000</u>		
11	Total Assets <u>61404</u>	12	Total Liabilities <u>61404</u>
13	Shares of common stock outstanding	<u>4525</u>	
14	Dividend declared on beginning number of shares (total \$)	<u>Computer Supplied</u>	
15	Dividends per Share	<u>Computer Supplied</u>	

¹ A balance sheet which had a value of net assets after payables equal to \$70039 (neglecting cash and investments) was used for the probability investigation instead of the \$41559 shown here which was used for all other investigations.

TABLE XXIII
SBU PROFIT AND LOSS DATA

00010	6569,4042,2527,1386,0,602,-104,435,1,0,27,9,1,73,1,0,0
00020	6517,0,0,0,0,0,0,0,328,1,0,27,7,1,73,2,0,0
00030	6569,0,0,0,0,0,0,0,435,1,0,27,7,1,73,3,0,777
00040	1698,625,1073,457,0,184,-13,419,1,0,35,1,2,73,1,0,0
00050	1648,0,0,0,0,0,0,0,294,1,0,34,1,2,73,2,0,0
00060	1678,0,0,0,0,0,0,0,419,1,0,35,1,2,73,3,0,777
00070	420,303,117,66,0,34,5,12,1,0,9,3,3,73,1,0,0
00080	432,0,0,0,0,0,0,0,34,1,0,10,7,3,73,2,0,0
00090	420,0,0,0,0,0,0,0,12,1,0,9,3,3,73,3,0,777
00100	400,881,119,52,0,23,-5,34,1,0,0,8,4,73,1,0,0
00110	400,0,0,0,0,0,0,0,76,1,0,0,9,4,73,2,0,0
00120	400,0,0,0,0,0,0,0,76,1,0,0,9,4,73,3,0,777
00130	5553,4782,831,340,0,458,-100,-57,1,0,35,8,5,73,1,0,0
00140	5550,0,0,0,0,0,0,0,-67,1,0,35,5,73,2,0,0
00150	5550,0,0,0,0,0,0,0,-67,1,0,35,8,5,73,3,0,777
00160	5354,6132,2216,199,0,571,-140,1306,1,0,46,4,6,73,1,0,0
00170	6229,0,0,0,0,0,0,0,1003,1,0,40,6,73,2,0,0
00180	6354,0,0,0,0,0,0,0,1306,1,0,46,4,6,73,3,0,777
00190	1162,853,309,115,0,57,-19,113,1,0,12,8,7,73,1,0,0
00200	674,0,0,0,0,0,0,0,40,1,0,11,0,7,73,2,0,0
00210	1162,0,0,0,0,0,0,0,118,1,0,12,8,7,73,3,0,777
00220	2960,2054,966,174,0,130,-56,536,1,0,79,9,8,73,1,0,0
00230	2960,0,0,0,0,0,0,0,536,1,0,79,9,8,73,2,0,0
00240	2960,0,0,0,0,0,0,0,536,1,0,79,9,8,73,3,0,777
00250	1432,1123,315,208,0,93,-37,-23,1,0,16,3,9,73,1,0,0
00260	1432,0,0,0,0,0,0,0,-23,1,0,16,3,9,73,2,0,0
00270	1499,0,0,0,0,0,0,0,-7,1,0,11,0,9,73,3,0,777
00280	719,0,0,0,0,0,0,0,52,1,0,10,10,73,1,0,0
00290	719,0,0,0,0,0,0,0,58,1,0,10,5,10,73,2,0,0
00300	719,572,147,48,0,34,-13,52,1,0,10,5,10,73,3,0,777
00310	2269,1069,1195,769,0,171,-37,218,1,0,13,5,11,73,1,0,0
00320	2480,0,0,0,0,0,0,0,276,1,0,14,7,11,73,2,0,0
00330	2269,0,0,0,0,0,0,0,218,1,0,13,5,11,73,3,0,777
00340	2957,0,0,0,0,0,0,0,353,1,0,33,5,12,73,1,0,0
00350	2957,2170,757,192,0,282,-46,267,1,0,33,5,12,73,2,0,0
00360	2957,0,0,0,0,0,0,0,353,1,0,33,5,12,73,3,0,777
00370	1929,1181,748,577,0,237,-34,-100,1,0,25,0,13,73,1,0,0
00380	1929,0,0,0,0,0,0,0,-100,1,0,25,13,73,2,0,0
00390	2194,0,0,0,0,0,0,0,-28,1,0,28,3,13,73,3,0,777
00400	570,0,0,0,0,0,0,0,235,1,0,15,4,14,73,1,0,0
00410	570,0,0,0,0,0,0,0,235,1,0,15,4,14,73,2,0,0
00420	855,423,432,56,0,16,-7,353,1,0,23,1,14,73,3,0,777
00430	2948,0,0,0,0,0,0,0,394,1,0,7,7,15,73,1,0,0
00440	3458,2480,978,231,0,145,-51,551,1,0,10,5,15,73,2,0,0
00450	2525,0,0,0,0,0,0,0,393,1,0,6,6,15,73,3,0,777
00460	910,606,304,195,0,40,-17,142,1,0,17,7,16,73,1,0,0

00470 805,0,0,0,0,0,0,0,115,1,0,15,7,16,73,2,0,0
 00480 910,0,0,0,0,0,0,0,142,1,0,15,7,16,73,3,0,777
 00490 1121,0,0,0,0,0,0,0,148,1,0,42,7,17,73,1,0,0
 00500 1121,790,331,99,0,60,-24,148,1,0,42,1,17,73,2,0,0
 00510 1083,0,0,0,0,0,0,0,155,1,0,41,3,17,73,3,0,777
 00520 30291,0,0,0,0,0,0,0,918,3,375,61,0,18,73,1,0,0
 00530 30291,14023,16268,4091,0,2310,-679,918,3,375,61,0,18,73,2,0,0
 00540 24447,0,0,0,0,0,0,0,8000,3,375,42,0,18,73,3,0,777
 00550 1369,1228,141,51,0,38,-12,40,1,0,22,1,19,73,1,0,0
 00560 1126,0,0,0,0,0,0,0,120,1,0,18,2,19,73,2,0,0
 00570 1369,0,0,0,0,0,0,0,40,1,0,22,1,19,73,3,0,777
 00580 0,0,0,0,0,0,0,0,1,0,0,20,73,1,0,0
 00590 97,0,0,0,0,0,0,0,-44,1,0,3,0,20,73,2,0,0
 00600 0,0,0,0,0,0,0,0,1,0,0,20,73,3,0,555
 00610 7320,4491,2889,1409,0,649,-119,652,1,0,28,2,1,74,1,0,0
 00620 7200,0,0,0,0,0,0,0,489,1,0,27,7,1,74,2,0,0
 00630 6750,0,0,0,0,0,0,0,455,1,0,26,0,1,74,3,0,777
 00640 2211,999,1212,669,0,224,-30,289,1,0,42,2,2,74,1,0,0
 00650 1709,0,0,0,0,0,0,0,319,1,0,32,6,2,74,2,0,0
 00660 1620,0,0,0,0,0,0,0,420,1,0,31,0,2,74,3,0,777
 00670 624,417,207,145,0,42,5,15,1,0,12,7,3,74,1,0,0
 00680 511,0,0,0,0,0,0,0,65,1,0,10,4,3,74,2,0,0
 00690 420,0,0,0,0,0,0,0,15,1,0,8,5,3,74,3,0,777
 00700 1008,679,329,169,0,57,-8,95,1,0,1,9,4,74,1,0,0
 00710 400,0,0,0,0,0,0,0,76,1,0,0,9,4,74,2,0,0
 00720 200,0,0,0,0,0,0,0,1,0,0,4,4,74,3,0,777
 00730 6781,5620,1161,380,0,496,-115,170,1,0,36,6,5,74,1,0,0
 00740 6400,0,0,0,0,0,0,0,141,1,0,35,5,74,2,0,0
 00750 5550,0,0,0,0,0,0,0,-67,1,0,30,5,74,3,0,777
 00760 9105,6593,2512,205,0,482,-143,168,1,0,47,1,6,74,1,0,0
 00770 6469,0,0,0,0,0,0,0,1143,1,0,40,6,74,2,0,0
 00780 8100,0,0,0,0,0,0,0,1300,1,0,42,6,6,74,3,0,777
 00790 1193,1013,380,130,0,86,-22,142,1,0,15,8,7,74,1,0,0
 00800 718,0,0,0,0,0,0,0,60,1,0,11,4,7,74,2,0,0
 00810 1040,0,0,0,0,0,0,0,100,1,0,11,5,7,74,3,0,777
 00820 2954,2029,925,174,0,136,-73,552,1,0,38,5,8,74,1,0,0
 00830 2680,0,0,0,0,0,0,0,475,1,0,79,9,8,74,2,0,0
 00840 2660,0,0,0,0,0,0,0,472,1,0,79,8,74,3,0,777
 00850 1584,1260,324,220,0,109,-39,-44,1,0,11,7,9,74,1,0,0
 00860 1350,0,0,0,0,0,0,0,-25,1,0,10,0,2,74,2,0,0
 00870 168,0,0,0,0,0,0,0,38,1,0,1,3,9,74,3,0,777
 00880 730,0,0,0,0,0,0,0,52,1,0,12,10,74,1,0,0
 00890 640,0,0,0,0,0,0,0,52,1,0,10,5,10,74,2,0,0
 00900 564,439,125,48,0,89,-10,38,1,0,9,3,10,74,3,0,777
 00910 3357,1608,1779,1057,0,204,-46,472,1,0,17,6,11,74,1,0,0
 00920 2828,0,0,0,0,0,0,0,396,1,0,14,7,11,74,2,0,0
 00930 2280,0,0,0,0,0,0,0,220,1,0,12,0,11,74,3,0,777
 00940 3420,0,0,0,0,0,0,0,390,1,0,34,5,12,74,1,0,0
 00950 3549,2631,918,211,0,293,-45,369,1,0,36,1,12,74,2,0,0
 00960 3030,0,0,0,0,0,0,0,526,1,0,30,8,12,74,3,0,777
 00970 2143,1237,906,634,0,242,-30,0,1,0,25,0,13,74,1,0,0
 00980 2150,0,0,0,0,0,0,0,1,0,25,13,74,2,0,0

00990 2323,0,0,0,0,0,0,141,1,0,27,2,13,74,3,0,777
 01000 695,0,0,0,0,0,0,104,1,0,16,5,14,74,1,0,0
 01010 580,0,0,0,0,0,0,230,1,0,13,8,14,74,2,0,0
 01020 815,446,369,78,0,16,-8,267,1,0,19,4,14,74,3,0,777
 01030 3323,0,0,0,0,0,0,432,1,0,8,1,15,74,1,0,0
 01040 4038,2959,1079,235,0,145,-52,647,1,0,10,7,15,74,2,0,0
 01050 2546,0,0,0,0,0,0,389,1,0,6,2,15,74,3,0,777
 01060 1900,673,327,108,0,40,-19,160,1,0,18,5,16,74,1,0,0
 01070 389,0,0,0,0,0,0,130,1,0,16,3,16,74,2,0,0
 01080 755,0,0,0,0,0,0,108,1,0,14,0,16,74,3,0,777
 01090 1220,0,0,0,0,0,0,160,1,0,44,0,17,74,1,0,0
 01100 1178,830,348,101,0,60,-24,163,1,0,42,7,17,74,2,0,0
 01110 1192,0,0,0,0,0,0,159,1,0,40,0,17,74,3,0,777
 01120 31303,0,0,0,0,0,0,9383,-398,63,0,18,74,2,0,0
 01130 31303,14590,16713,4275,0,2480,-635,9323,-398,63,0,18,74,2,0,0
 01140 14609,0,0,0,0,0,0,-828,-375,29,4,18,74,3,0,777
 01150 1656,1140,310,60,0,50,-37,363,1,0,24,9,19,74,1,0,0
 01160 1231,0,0,0,0,0,0,312,1,0,16,5,19,74,2,0,0
 01170 1320,0,0,0,0,0,0,46,1,0,20,0,19,74,3,0,777
 01180 266,250,16,22,0,25,-2,-33,1,0,16,0,20,74,1,0,0
 01190 242,0,0,0,0,0,0,8,1,0,14,7,20,74,2,0,0
 01200 0,0,0,0,0,0,0,1,0,0,20,74,3,0,555
 01210 8160,4904,3254,1559,0,718,-130,249,1,0,30,3,1,75,1,0,0
 01220 7949,0,0,0,0,0,0,738,1,0,27,7,1,75,2,0,0
 01230 6859,0,0,0,0,0,0,465,1,0,24,0,1,75,3,0,777
 01240 2419,1151,1268,703,0,227,-48,290,1,0,43,3,2,75,1,0,0
 01250 1826,0,0,0,0,0,0,336,1,0,32,7,2,75,2,0,0
 01260 1510,0,0,0,0,0,0,425,1,0,27,0,2,75,3,0,777
 01270 750,461,319,162,0,48,7,102,1,0,14,6,3,75,1,0,0
 01280 542,0,0,0,0,0,0,70,1,0,10,1,3,75,2,0,0
 01290 415,0,0,0,0,0,0,17,1,0,7,7,3,75,3,0,777
 01300 2000,1260,740,330,0,111,-12,237,1,0,3,3,4,75,1,0,0
 01310 400,0,0,0,0,0,0,76,1,0,0,9,4,75,2,0,0
 01320 0,0,0,0,0,0,0,1,0,0,4,75,3,0,777
 01330 7384,5984,1398,410,0,526,-123,339,1,0,40,6,5,75,1,0,0
 01340 6350,0,0,0,0,0,0,155,1,0,35,5,75,2,0,0
 01350 4580,0,0,0,0,0,0,-80,1,0,27,5,75,3,0,777
 01360 9391,6653,2735,215,0,484,-143,1896,1,0,48,7,6,75,1,0,0
 01370 6878,0,0,0,0,0,0,1471,1,0,40,6,75,2,0,0
 01380 7340,0,0,0,0,0,0,1250,1,0,33,0,6,75,3,0,777
 01390 1588,1130,458,145,0,94,-24,195,1,0,17,7,7,75,1,0,0
 01400 776,0,0,0,0,0,0,22,1,0,11,5,7,75,2,0,0
 01410 960,0,0,0,0,0,0,95,1,0,10,8,7,75,3,0,777
 01420 2971,2016,955,155,0,143,-62,595,1,0,55,8,5,75,1,0,0
 01430 2760,0,0,0,0,0,0,500,1,0,79,9,8,75,2,0,0
 01440 2500,0,0,0,0,0,0,452,1,0,72,8,75,3,0,777
 01450 1959,1532,427,230,0,133,-42,22,1,0,14,8,9,75,1,0,0
 01460 1325,0,0,0,0,0,0,-25,1,0,10,0,9,75,2,0,0
 01470 148,0,0,0,0,0,0,32,1,0,1,1,9,75,3,0,777
 01480 825,0,0,0,0,0,0,52,1,0,13,10,75,1,0,0
 01490 668,0,0,0,0,0,0,54,1,0,10,5,10,75,2,0,0
 01500 501,380,121,40,0,24,-8,49,1,0,7,9,10,75,3,0,777

01510 5135,2611,2514,1443,0,355,-69,647,1,0,24,4,11,75,1,0,0
 01520 2913,0,0,0,0,0,0,0,506,1,0,13,8,11,75,2,0,0
 01530 2200,0,0,0,0,0,0,0,220,1,0,10,5,11,75,3,0,777
 01540 3600,0,0,0,0,0,0,0,420,1,0,35,5,12,75,1,0,0
 01550 3723,2754,969,178,0,275,-45,471,1,0,34,5,12,75,2,0,0
 01560 2816,0,0,0,0,0,0,0,439,1,0,26,3,12,75,3,0,777
 01570 2432,1471,961,659,0,250,-35,17,1,0,24,8,13,75,1,0,0
 01580 2430,0,0,0,0,0,0,0,17,1,0,25,13,75,2,0,0
 01590 2233,0,0,0,0,0,0,0,133,1,0,22,8,13,75,3,0,777
 01600 830,0,0,0,0,0,0,0,125,1,0,17,7,14,75,1,0,0
 01610 590,0,0,0,0,0,0,0,225,1,0,12,5,14,75,2,0,0
 01620 750,508,242,66,0,16,-9,151,1,0,15,9,14,75,3,0,777
 01630 3592,0,0,0,0,0,0,0,535,1,0,8,1,15,75,1,0,0
 01640 4345,3154,1191,267,0,165,-54,705,1,0,10,6,15,75,2,0,0
 01650 2589,0,0,0,0,0,0,0,401,1,0,5,2,15,75,3,0,777
 01660 1109,746,354,121,0,44,-21,168,1,0,19,4,16,75,1,0,0
 01670 930,0,0,0,0,0,0,0,140,1,0,16,3,16,75,2,0,0
 01680 735,0,0,0,0,0,0,0,105,1,0,13,0,16,75,3,0,777
 01690 1330,8,0,0,0,0,0,0,300,1,0,46,0,17,75,1,0,0
 01700 1235,370,365,103,0,60,-25,177,1,0,42,7,17,75,2,0,0
 01710 1126,0,0,0,0,0,0,0,166,1,0,32,2,17,75,3,0,777
 01720 33100,0,0,0,0,0,0,0,9750,-393,65,0,18,75,2,0,0
 01730 32029,15249,16780,4350,0,2634,-664,9132,-393,63,0,18,75,2,0,0
 01740 16299,0,0,0,0,0,0,0,2058,-375,32,18,75,3,0,777
 01750 1942,1266,676,55,0,50,-37,534,1,0,27,4,19,75,1,0,0
 01760 1388,0,0,0,0,0,0,0,289,1,0,19,6,19,75,3,0,0
 01770 1270,0,0,0,0,0,0,0,40,1,0,18,0,19,75,3,0,777
 01780 590,445,145,38,0,17,-2,38,1,0,28,6,20,75,1,0,0
 01790 350,0,0,0,0,0,0,0,70,1,0,16,8,20,75,2,0,0
 01800 0,0,0,0,0,0,0,0,1,0,0,20,75,3,0,555
 01810 9090,5372,3718,1655,0,736,-136,1191,1,0,33,5,1,76,1,0,0
 01820 8775,0,0,0,0,0,0,0,977,1,0,27,7,1,76,2,0,0
 01830 7200,0,0,0,0,0,0,0,500,1,0,22,0,1,76,3,0,777
 01840 2716,1278,1438,759,0,267,-53,359,1,0,44,1,2,76,1,0,0
 01850 2020,0,0,0,0,0,0,0,361,1,0,32,8,2,76,2,0,0
 01860 1450,0,0,0,0,0,0,0,430,1,0,23,5,2,76,3,0,777
 01870 1014,600,414,193,0,62,8,146,1,0,17,5,3,76,1,0,0
 01880 574,0,0,0,0,0,0,0,84,1,0,9,9,3,76,2,0,0
 01890 395,0,0,0,0,0,0,0,20,1,0,6,8,3,76,3,0,777
 01900 2500,1559,941,445,0,135,-14,347,1,0,3,6,4,76,1,0,0
 01910 400,0,0,0,0,0,0,0,76,1,0,0,9,4,76,2,0,0
 01920 0,0,0,0,0,0,0,0,1,0,0,4,76,3,0,777
 01930 9053,7250,1803,450,0,589,-143,621,1,0,41,8,5,76,1,0,0
 01940 7600,0,0,0,0,0,0,0,350,1,0,35,5,76,2,0,0
 01950 5100,0,0,0,0,0,0,0,-70,1,0,23,5,5,76,3,0,777
 01960 9653,6740,2913,227,0,486,-141,2059,1,0,50,3,6,76,1,0,0
 01970 7337,0,0,0,0,0,0,0,1604,1,0,40,6,76,2,0,0
 01980 6500,3,0,0,0,0,0,0,1150,1,0,34,0,6,76,3,0,777
 01990 1750,1228,522,150,0,93,-25,254,1,0,19,7,7,76,1,0,0
 02000 825,0,0,0,0,0,0,0,108,1,0,10,9,7,76,2,0,0
 02010 370,0,0,0,0,0,0,0,90,1,0,9,8,7,76,3,0,777
 02020 2950,1990,960,140,0,126,-60,634,1,0,22,8,8,76,1,0,0

02030 2840,0,0,0,0,0,0,575,1,0,79,9,8,76,2,0,0
 02040 2250,0,0,0,0,0,0,410,1,0,63,8,76,3,0,777
 02050 2617,2033,584,230,0,170,-47,137,1,0,19,7,9,76,1,0,0
 02060 1327,0,0,0,0,0,0,-25,1,0,10,0,9,76,2,0,0
 02070 98,0,0,0,0,0,0,12,1,0,0,7,9,76,3,0,777
 02080 985,0,0,0,0,0,0,52,1,0,15,10,76,1,0,0
 02090 690,0,0,0,0,0,0,56,1,0,10,5,10,76,2,0,0
 02100 417,310,107,30,0,22,-6,49,1,0,6,4,10,76,3,0,777
 02110 6205,3264,2941,1635,0,443,-83,780,1,0,26,2,11,76,1,0,0
 02120 2986,0,0,0,0,0,0,593,1,0,12,6,11,76,2,0,0
 02130 2130,0,0,0,0,0,0,220,1,0,9,0,11,76,3,0,777
 02140 4250,0,0,0,0,0,0,470,1,0,36,5,12,76,1,0,0
 02150 3497,2605,892,147,0,222,-43,480,1,0,29,1,12,76,2,0,0
 02160 2612,0,0,0,0,0,0,316,1,0,21,8,12,76,3,0,777
 02170 2908,1807,1101,692,0,275,-40,94,1,0,27,1,13,76,1,0,0
 02180 2630,0,0,0,0,0,0,73,1,0,25,13,76,2,0,0
 02190 2146,0,0,0,0,0,0,87,1,0,28,0,13,76,3,0,777
 02200 985,0,0,0,0,0,0,148,1,0,18,9,14,76,1,0,0
 02210 590,0,0,0,0,0,0,210,1,0,11,4,14,76,2,0,0
 02220 835,555,280,79,0,16,-10,175,1,0,16,0,14,76,3,0,777
 02230 3861,0,0,0,0,0,0,616,1,0,8,2,15,76,1,0,0
 02240 4546,3273,1273,286,0,165,-55,767,1,0,10,6,15,76,2,0,0
 02250 2616,0,0,0,0,0,0,406,1,0,5,5,15,76,3,0,777
 02260 1299,873,417,130,0,43,-23,221,1,0,21,7,16,76,1,0,0
 02270 980,0,0,0,0,0,0,159,1,0,16,4,16,76,2,0,0
 02280 715,0,0,0,0,0,0,192,1,0,12,0,16,76,3,0,777
 02290 1480,0,0,0,0,0,0,215,1,0,48,0,17,76,1,0,0
 02300 1361,920,361,195,0,60,-25,191,1,0,42,8,17,76,2,0,0
 02310 1149,0,0,0,0,0,0,174,1,0,27,8,17,76,3,0,777
 02320 35800,0,0,0,0,0,0,10800,410,67,5,16,76,1,0,0
 02330 33449,16240,17209,4400,0,2794,-692,9323,410,63,0,18,76,2,0,0
 02340 18798,0,0,0,0,0,0,4206,3,5,35,3,18,76,3,0,777
 02350 2282,1492,790,55,0,50,-39,646,1,0,30,3,19,76,1,0,0
 02360 1579,0,0,0,0,0,0,222,1,0,21,0,19,76,2,0,0
 02370 1210,0,0,0,0,0,0,40,1,0,16,0,19,76,3,0,777
 02380 901,615,286,40,0,17,-2,227,1,0,31,7,20,76,1,0,0
 02390 419,0,0,0,0,0,0,119,1,0,14,7,20,76,2,0,0
 02400 266,0,0,0,0,0,0,-33,1,0,9,4,20,76,3,0,555
 02410 10695,5885,4210,1807,0,798,-131,1474,1,0,36,0,1,77,1,0,555
 02420 9443,0,0,0,0,0,0,1152,1,0,27,7,1,77,2,0,555
 02430 7900,0,0,0,0,0,0,480,1,0,20,0,1,77,3,0,555
 02440 3102,1440,1662,824,0,290,-58,490,1,0,44,0,2,77,1,0,555
 02450 2306,0,0,0,0,0,0,452,1,0,32,7,2,77,2,0,555
 02460 1415,0,0,0,0,0,0,435,1,0,26,0,2,77,3,0,555
 02470 1300,770,530,243,0,77,10,200,1,0,20,8,3,77,1,0,555
 02480 608,0,0,0,0,0,0,90,1,0,9,7,3,77,2,0,555
 02490 375,0,0,0,0,0,0,26,1,0,6,0,3,77,3,0,555
 02500 3000,1972,1128,585,0,159,-17,427,1,0,3,8,4,77,1,0,555
 02510 400,0,0,0,0,0,0,76,1,0,0,9,4,77,2,0,555
 02520 0,0,0,0,0,0,0,1,0,0,4,77,3,0,555
 02530 10860,8443,2243,480,0,634,-160,969,1,0,42,3,5,77,1,0,555
 02540 8950,0,0,0,0,0,0,615,1,0,35,5,77,2,0,555

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02550 5100,0,0,0,0,0,0,-70,1,0,20,0,5,77,3,0,555
02560 10349,7121,3228,238,0,463,-142,2385,1,0,50,5,6,77,1,0,555
02570 8019,0,0,0,0,0,0,1810,1,0,40,6,77,2,0,555
02580 6150,0,0,0,0,0,0,1090,1,0,30,0,6,77,3,0,555
02590 1979,1370,609,160,0,87,-27,335,1,0,21,7,7,7,1,0,555
02600 905,0,0,0,0,0,0,127,1,0,11,5,7,77,2,0,555
02610 810,0,0,0,0,0,0,55,1,0,8,8,7,77,3,0,555
02620 3065,2064,1801,140,0,121,-59,661,1,0,81,8,8,77,1,0,555
02630 2990,0,0,0,0,0,0,650,1,0,79,9,8,77,2,0,555
02640 2020,0,0,0,0,0,0,304,1,0,54,8,77,3,0,555
02650 3252,2494,758,240,0,179,-53,237,1,0,21,7,9,77,1,0,555
02660 1500,0,0,0,0,0,0,10,1,0,10,0,9,77,2,0,555
02670 76,0,0,0,0,0,0,3,1,0,0,5,9,77,3,0,555
02680 1120,0,0,0,0,0,0,52,1,0,16,10,77,1,0,555
02690 740,0,0,0,0,0,0,60,1,0,10,5,10,77,2,0,555
02700 416,305,111,0,0,0,24,-6,31,1,0,5,9,10,77,3,0,555
02710 7615,4188,3430,1812,0,501,-92,1009,1,0,29,2,11,77,1,0,555
02720 3046,0,0,0,0,0,0,625,1,0,11,7,11,77,2,0,555
02730 2100,0,0,0,0,0,0,220,1,0,8,0,11,77,3,0,555
02740 4650,0,0,0,0,0,0,520,1,0,37,5,12,77,1,0,555
02750 3171,2329,842,110,0,219,-38,466,1,0,23,3,12,77,2,0,555
02760 2419,0,0,0,0,0,0,248,1,0,17,7,12,77,3,0,555
02770 3311,2095,1216,756,0,269,-44,147,1,0,27,8,13,77,1,0,555
02780 3000,0,0,0,0,0,0,100,1,0,25,13,77,2,0,555
02790 2061,0,0,0,0,0,0,28,1,0,17,3,13,77,3,0,555
02800 1140,0,0,0,0,0,0,170,1,0,20,0,14,77,1,0,555
02810 595,0,0,0,0,0,0,200,1,0,10,4,14,77,2,0,555
02820 220,610,310,84,0,16,-11,199,1,0,16,1,14,77,3,0,555
02830 4152,0,0,0,0,0,0,712,1,0,8,2,15,77,1,0,555
02840 4905,3508,1397,296,0,165,-56,280,1,0,10,7,15,77,2,0,555
02850 2631,0,0,0,0,0,0,411,1,0,5,2,15,77,3,0,555
02860 1400,955,445,133,0,43,-25,244,1,0,22,4,16,77,1,0,555
02870 1025,0,0,0,0,0,0,175,1,0,16,5,16,77,2,0,555
02880 690,0,0,0,0,0,0,95,1,0,11,0,16,77,3,0,555
02890 1600,0,0,0,0,0,0,230,1,0,50,0,17,77,1,0,555
02900 1363,960,403,107,0,60,-26,210,1,0,42,7,17,77,2,0,555
02910 1173,0,0,0,0,0,0,177,1,0,36,8,17,77,3,0,555
02920 32200,0,0,0,0,0,0,1100,410,70,0,10,77,1,0,555
02930 34954,17596,17358,4450,0,2962,-709,9237,410,64,0,18,77,2,0,55
02940 21465,0,0,0,0,0,0,6369,375,29,4,18,77,3,0,555
02950 2695,1767,928,55,0,50,-40,783,1,0,33,5,19,77,1,0,555
02960 1738,0,0,0,0,0,0,247,1,0,21,6,19,77,2,0,555
02970 1130,0,0,0,0,0,0,40,1,0,14,0,19,77,3,0,555
02980 1154,705,449,42,0,18,-3,386,1,0,31,4,20,77,1,0,555
02990 478,0,0,0,0,0,0,178,1,0,13,0,20,77,2,0,555
03000 350,0,0,0,0,0,0,70,1,0,9,5,20,77,3,0,555
03010 0,0,0,0,0,0,0,0,0,0,0,78,0,0,999
EDIT END

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TABLE XXIV
SBU ASSETS AND LIABILITIES DATA

00020	2570,1783,2270,585,790,0,0,0,0,0,1,73,1,0,0
00030	2570,1783,2270,585,790,0,0,0,0,0,1,73,2,0,0
00040	2570,1783,2270,585,790,0,0,0,0,0,1,73,3,0,777
00050	386,354,326,100,118,0,0,0,0,0,2,73,1,0,0
00060	396,362,330,100,122,0,0,0,0,0,2,73,2,0,0
00070	386,354,326,100,118,0,0,0,0,0,2,73,3,0,777
00080	180,105,40,40,55,0,0,0,0,0,3,73,1,0,0
00090	202,118,44,44,62,0,0,0,0,0,3,73,2,0,0
00100	180,105,40,40,55,0,0,0,0,0,3,73,3,0,777
00110	139,110,250,30,43,0,0,0,0,0,4,73,1,0,0
00120	105,82,189,30,33,0,0,0,0,0,4,73,2,0,0
00130	105,82,189,30,33,0,0,0,0,0,4,73,3,0,777
00140	1781,966,1340,471,550,0,0,0,0,0,5,73,1,0,0
00150	1781,966,1340,471,550,0,0,0,0,0,5,73,2,0,0
00160	1781,966,1340,471,550,0,0,0,0,0,5,73,3,0,777
00170	2291,1454,1735,606,705,0,0,0,0,0,6,73,1,0,0
00180	1760,1120,1330,209,541,0,0,0,0,0,6,73,2,0,0
00190	2291,1454,1735,606,705,0,0,0,0,0,6,73,3,0,777
00200	319,200,242,84,98,0,0,0,0,0,7,73,1,0,0
00210	168,118,143,84,58,0,0,0,0,0,7,73,2,0,0
00220	319,200,242,84,98,0,0,0,0,0,7,73,3,0,777
00230	771,516,585,204,237,0,0,0,0,0,8,73,1,0,0
00240	771,516,585,204,237,0,0,0,0,0,8,73,2,0,0
00250	771,516,585,204,237,0,0,0,0,0,8,73,3,0,777
00260	423,249,321,112,131,0,0,0,0,0,9,73,1,0,0
00270	423,249,321,112,131,0,0,0,0,0,9,73,2,0,0
00280	420,348,322,112,131,0,0,0,0,0,9,73,3,0,777
00290	215,126,163,57,66,0,0,0,0,0,10,73,1,0,0
00300	215,126,163,57,66,0,0,0,0,0,10,73,2,0,0
00310	215,126,163,57,66,0,0,0,0,0,10,73,3,0,777
00320	533,632,1062,502,163,0,0,0,0,0,11,73,1,0,0
00330	530,630,1064,502,162,0,0,0,0,0,11,73,2,0,0
00340	533,632,1062,502,163,0,0,0,0,0,11,73,3,0,777
00350	837,524,1291,599,258,0,0,0,0,0,12,73,1,0,0
00360	837,524,1291,599,258,0,0,0,0,0,12,73,2,0,0
00370	837,524,1291,599,258,0,0,0,0,0,12,73,3,0,777
00380	635,376,957,444,195,0,0,0,0,0,13,73,1,0,0
00390	635,376,957,444,195,0,0,0,0,0,13,73,2,0,0
00400	635,376,957,444,195,0,0,0,0,0,13,73,3,0,777
00410	136,100,120,32,42,0,0,0,0,0,14,73,1,0,0
00420	136,104,60,32,43,0,0,0,0,0,14,73,2,0,0
00430	150,120,60,32,44,0,0,0,0,0,14,73,3,0,777
00440	815,560,1715,611,250,0,0,0,0,0,15,73,1,0,0
00450	890,610,1860,611,274,0,0,0,0,0,15,73,2,0,0
00460	690,475,1440,611,220,0,0,0,0,0,15,73,3,0,777
00470	120,120,330,101,37,0,0,0,0,0,16,73,1,0,0

00480 115,115,320,101,35,0,0,0,0,0,16,73,2,0,0
 00490 120,120,330,101,37,0,0,0,0,0,16,73,3,0,777
 00500 170,160,300,99,58,0,0,0,0,0,17,73,1,0,0
 00510 170,160,300,99,58,0,0,0,0,0,17,73,2,0,0
 00520 165,155,290,99,51,0,0,0,0,0,17,73,3,0,777
 00530 6500,7400,17235,7036,1960,0,0,0,0,0,18,73,1,0,0
 00540 6336,7200,16033,7036,1960,0,0,0,0,0,18,73,2,0,0
 00550 5800,4400,16300,7300,1700,0,0,0,0,0,18,73,3,0,777
 00560 864,300,250,167,265,0,0,0,0,0,19,73,1,0,0
 00570 517,180,153,95,160,0,0,0,0,0,19,73,2,0,0
 00580 664,300,250,167,265,0,0,0,0,0,19,73,3,0,777
 00590 0,0,0,0,0,0,0,0,0,0,20,73,1,0,0
 00600 16,17,45,5,6,0,0,0,0,0,20,73,2,0,0
 00610 0,0,0,0,0,0,0,0,0,0,20,73,3,0,555
 00620 2165,1906,2574,745,665,0,0,0,0,0,1,74,1,0,0
 00630 2140,1590,2615,672,660,0,0,0,0,0,1,74,2,0,0
 00640 2616,1330,2345,745,505,0,0,0,0,0,1,74,3,0,777
 00650 421,405,350,112,130,0,0,0,0,0,2,74,1,0,0
 00660 420,384,353,107,129,0,0,0,0,0,2,74,2,0,0
 00670 370,340,325,112,113,0,0,0,0,0,2,74,3,0,777
 00680 202,155,54,37,62,0,0,0,0,0,3,74,1,0,0
 00690 205,121,49,45,64,0,0,0,0,0,3,74,2,0,0
 00700 180,100,40,40,55,0,0,0,0,0,3,74,3,0,777
 00710 315,250,250,45,95,0,0,0,0,0,4,74,1,0,0
 00720 105,82,189,40,33,0,0,0,0,0,4,74,2,0,0
 00730 0,0,0,0,0,0,0,0,0,0,4,74,3,0,777
 00740 1896,1154,1951,643,584,0,0,0,0,0,5,74,1,0,0
 00750 1250,1080,1540,605,570,0,0,0,0,0,5,74,2,0,0
 00760 1781,966,1340,605,550,0,0,0,0,0,5,74,3,0,777
 00770 2212,1551,2273,749,665,0,0,0,0,0,6,74,1,0,0
 00780 1830,1162,1389,406,565,0,0,0,0,0,6,74,2,0,0
 00790 2150,1400,1700,740,660,0,0,0,0,0,6,74,3,0,777
 00800 342,236,352,116,106,0,0,0,0,0,7,74,1,0,0
 00810 201,126,154,96,62,0,0,0,0,0,7,74,2,0,0
 00820 300,160,235,110,92,0,0,0,0,0,7,74,3,0,777
 00830 672,503,557,230,200,0,0,0,0,0,8,74,1,0,0
 00840 615,450,530,230,190,0,0,0,0,0,8,74,2,0,0
 00850 605,450,455,230,187,0,0,0,0,0,8,74,3,0,777
 00860 423,271,434,143,131,0,0,0,0,0,9,74,1,0,0
 00870 360,230,320,140,115,0,0,0,0,0,9,74,2,0,0
 00880 40,32,36,36,12,0,0,0,0,0,9,74,3,0,777
 00890 220,128,200,73,65,0,0,0,0,0,10,74,1,0,0
 00900 190,113,163,67,58,0,0,0,0,0,10,74,2,0,0
 00910 142,95,156,50,45,0,0,0,0,0,10,74,3,0,777
 00920 619,552,1556,744,252,0,0,0,0,0,11,74,1,0,0
 00930 568,675,1155,187,172,0,0,0,0,0,11,74,2,0,0
 00940 530,635,1082,700,163,0,0,0,0,0,11,74,3,0,777
 00950 970,605,1500,739,205,0,0,0,0,0,12,74,1,0,0
 00960 982,637,1510,722,304,0,0,0,0,0,12,74,2,0,0
 00970 510,502,1258,664,250,0,0,0,0,0,12,74,3,0,777
 00980 706,429,1052,504,218,0,0,0,0,0,13,74,1,0,0
 00990 706,429,1052,504,218,0,0,0,0,0,13,74,2,0,0

01000 636,377,957,444,195,0,0,0,0,13,74,3,0,777
 01010 150,115,140,62,46,0,0,0,0,14,74,1,0,0
 01020 133,107,60,48,43,0,0,0,0,14,74,2,0,0
 01030 165,130,60,48,51,0,0,0,0,14,74,3,0,777
 01040 845,582,1773,696,860,0,0,0,0,15,74,1,0,0
 01050 1130,665,1980,751,348,0,0,0,0,15,74,2,0,0
 01060 690,475,1440,683,220,0,0,0,0,15,74,3,0,777
 01070 145,145,330,117,42,0,0,0,0,16,74,1,0,0
 01080 120,120,330,117,37,0,0,0,0,16,74,2,0,0
 01090 100,100,320,117,31,0,0,0,0,16,74,3,0,777
 01100 180,170,300,170,56,0,0,0,0,17,74,1,0,0
 01110 160,165,300,170,55,0,0,0,0,17,74,2,0,0
 01120 167,157,296,113,51,0,0,0,0,17,74,3,0,777
 01130 6700,7600,18108,7590,2000,0,0,0,0,18,74,1,0,0
 01140 6500,6500,17235,7536,2000,0,0,0,0,18,74,2,0,0
 01150 4500,3600,16730,8100,1390,0,0,0,0,18,74,3,0,777
 01160 775,340,410,210,236,0,0,0,0,19,74,1,0,0
 01170 408,142,120,192,126,0,0,0,0,19,74,2,0,0
 01180 606,300,250,200,185,0,0,0,0,19,74,3,0,777
 01190 165,50,264,24,32,0,0,0,0,20,74,1,0,0
 01200 90,31,229,10,27,0,0,0,0,20,74,2,0,0
 01210 0,0,0,0,0,0,0,0,0,20,74,3,0,555
 01220 2311,2101,2700,890,714,0,0,0,0,1,75,1,0,0
 01230 2250,2020,2689,767,705,0,0,0,0,1,75,2,0,0
 01240 2650,1860,2420,870,815,0,0,0,0,1,75,3,0,777
 01250 491,425,455,132,151,0,0,0,0,2,75,1,0,0
 01260 446,410,375,114,137,0,0,0,0,2,75,2,0,0
 01270 360,320,320,124,110,0,0,0,0,2,75,3,0,777
 01280 224,155,20,41,69,0,0,0,0,3,75,1,0,0
 01290 213,125,46,46,65,0,0,0,0,3,75,2,0,0
 01300 175,95,40,40,54,0,0,0,0,3,75,3,0,777
 01310 580,500,300,60,170,0,0,0,0,4,75,1,0,0
 01320 105,32,159,50,33,0,0,0,0,4,75,2,0,0
 01330 0,0,0,0,0,0,0,0,0,4,75,3,0,777
 01340 2006,1243,2157,811,620,0,0,0,0,5,75,1,0,0
 01350 1800,1075,1540,759,560,0,0,0,0,5,75,2,0,0
 01360 1530,850,1340,739,470,0,0,0,0,5,75,3,0,777
 01370 2213,1575,2379,895,685,0,0,0,0,6,75,1,0,0
 01380 1900,1210,1449,532,585,0,0,0,0,6,75,2,0,0
 01390 2000,1300,1650,860,615,0,0,0,0,6,75,3,0,777
 01400 378,268,406,153,116,0,0,0,0,7,75,1,0,0
 01410 221,138,148,111,65,0,0,0,0,7,75,2,0,0
 01420 230,165,230,135,66,0,0,0,0,7,75,3,0,777
 01430 667,500,717,270,205,0,0,0,0,8,75,1,0,0
 01440 625,465,575,255,193,0,0,0,0,8,75,2,0,0
 01450 565,425,455,240,173,0,0,0,0,8,75,3,0,777
 01460 513,325,552,208,158,0,0,0,0,9,75,1,0,0
 01470 355,225,320,170,119,0,0,0,0,9,75,2,0,0
 01480 35,20,32,32,11,0,0,0,0,9,75,3,0,777
 01490 250,145,240,93,77,0,0,0,0,10,75,1,0,0
 01500 209,117,163,77,61,0,0,0,0,10,75,2,0,0
 01510 124,84,133,50,38,0,0,0,0,10,75,3,0,777

01520 1174,1211,2310,1118,360,0,0,0,0,0,11,75,1,0,0
 01530 596,710,1210,244,184,0,0,0,0,0,11,75,2,0,0
 01540 520,625,1082,900,160,0,0,0,0,0,11,75,3,0,777
 01550 1070,675,1800,280,330,0,0,0,0,0,12,75,1,0,0
 01560 1021,680,1643,794,315,0,0,0,0,0,12,75,2,0,0
 01570 775,480,1177,727,238,0,0,0,0,0,12,75,3,0,777
 01580 755,467,1191,571,232,0,0,0,0,0,13,75,1,0,0
 01590 755,467,1075,571,232,0,0,0,0,0,13,75,2,0,0
 01600 620,370,938,492,192,0,0,0,0,0,13,75,3,0,777
 01610 130,130,160,97,55,0,0,0,0,0,14,75,1,0,0
 01620 141,109,60,60,43,0,0,0,0,0,14,75,2,0,0
 01630 180,145,60,60,55,0,0,0,0,0,14,75,3,0,777
 01640 910,625,1905,784,280,0,0,0,0,0,15,75,1,0,0
 01650 1345,620,2260,963,414,0,0,0,0,0,15,75,2,0,0
 01660 690,475,1440,785,220,0,0,0,0,0,15,75,3,0,777
 01670 175,175,430,143,54,0,0,0,0,0,16,75,1,0,0
 01680 124,124,342,146,38,0,0,0,0,0,16,75,2,0,0
 01690 95,95,310,143,29,0,0,0,0,0,16,75,3,0,777
 01700 200,125,300,141,62,0,0,0,0,0,17,75,1,0,0
 01710 190,175,300,141,59,0,0,0,0,0,17,75,2,0,0
 01720 170,160,300,128,52,0,0,0,0,0,17,75,3,0,777
 01730 7300,2200,19500,2500,2200,0,0,0,0,0,18,75,1,0,0
 01740 6909,6581,18108,8136,2125,0,0,0,0,0,18,75,2,0,0
 01750 4600,4200,16990,8900,1420,0,0,0,0,0,18,75,3,0,777
 01760 910,399,560,265,280,0,0,0,0,0,19,75,1,0,0
 01770 560,195,165,108,173,0,0,0,0,0,19,75,2,0,0
 01780 530,890,250,225,169,0,0,0,0,0,19,75,3,0,777
 01790 133,121,334,54,41,0,0,0,0,0,20,75,1,0,0
 01800 102,95,274,33,33,0,0,0,0,0,20,75,2,0,0
 01810 0,0,0,0,0,0,0,0,0,0,20,75,3,0,555
 01820 2545,2337,2921,1035,785,0,0,0,0,0,1,76,1,0,0
 01830 2440,2230,2371,861,755,0,0,0,0,0,1,76,2,0,0
 01840 2780,1950,2490,1000,855,0,0,0,0,0,1,76,3,0,777
 01850 548,476,552,155,169,0,0,0,0,0,2,76,1,0,0
 01860 485,444,405,126,149,0,0,0,0,0,2,76,2,0,0
 01870 340,305,315,136,105,0,0,0,0,0,2,76,3,0,777
 01880 289,253,95,47,59,0,0,0,0,0,3,76,1,0,0
 01890 217,126,50,47,56,0,0,0,0,0,3,76,2,0,0
 01900 170,90,40,40,52,0,0,0,0,0,3,76,3,0,777
 01910 721,625,320,75,222,0,0,0,0,0,4,76,1,0,0
 01920 105,22,189,60,33,0,0,0,0,0,4,76,2,0,0
 01930 0,0,0,0,0,0,0,0,0,0,4,76,3,0,777
 01940 2443,1508,2472,1076,755,0,0,0,0,0,5,76,1,0,0
 01950 2040,1280,1740,913,630,0,0,0,0,0,5,76,2,0,0
 01960 1640,885,1340,673,505,0,0,0,0,0,5,76,3,0,777
 01970 2247,1610,2273,985,700,0,0,0,0,0,6,76,1,0,0
 01980 2040,1295,1559,690,627,0,0,0,0,0,6,76,2,0,0
 01990 1900,1200,1600,950,585,0,0,0,0,0,6,76,3,0,777
 02000 413,291,418,131,127,0,0,0,0,0,7,76,1,0,0
 02010 240,151,181,109,74,0,0,0,0,0,7,76,2,0,0
 02020 260,150,225,160,80,0,0,0,0,0,7,76,3,0,777
 02030 662,494,669,290,200,0,0,0,0,0,8,76,1,0,0

02040 640,485,570,280,198,0,0,0,0,0,0,0,76,2,0,0
 02050 505,383,425,250,155,0,0,0,0,0,0,0,76,3,0,777
 02060 681,437,684,299,210,0,0,0,0,0,0,0,76,1,0,0
 02070 355,225,320,200,110,0,0,0,0,0,0,0,76,2,0,0
 02080 24,13,21,21,7,0,0,0,0,0,0,0,76,3,0,777
 02090 295,172,280,117,91,0,0,0,0,0,0,0,76,1,0,0
 02100 205,121,163,57,63,0,0,0,0,0,0,0,76,2,0,0
 02110 105,71,106,46,32,0,0,0,0,0,0,0,76,3,0,777
 02120 132,140,247,134,141,0,0,0,0,0,0,0,76,1,0,0
 02130 630,750,1281,304,194,0,0,0,0,0,0,0,76,2,0,0
 02140 500,620,1082,1082,155,0,0,0,0,0,0,0,76,3,0,777
 02150 1200,760,2106,1060,370,0,0,0,0,0,0,0,76,1,0,0
 02160 941,619,1563,723,290,0,0,0,0,0,0,0,76,2,0,0
 02170 735,460,1153,785,226,0,0,0,0,0,0,0,76,3,0,777
 02180 860,541,1276,671,265,0,0,0,0,0,0,0,76,1,0,0
 02190 820,495,1125,650,253,0,0,0,0,0,0,0,76,2,0,0
 02200 617,367,928,538,190,0,0,0,0,0,0,0,76,3,0,777
 02210 230,165,180,137,71,0,0,0,0,0,0,0,76,1,0,0
 02220 143,112,60,60,43,0,0,0,0,0,0,0,76,2,0,0
 02230 200,160,60,60,62,0,0,0,0,0,0,0,76,3,0,777
 02240 945,650,1995,379,290,0,0,0,0,0,0,0,76,1,0,0
 02250 1550,770,2650,1197,476,0,0,0,0,0,0,0,76,2,0,0
 02260 690,475,1440,327,220,0,0,0,0,0,0,0,76,3,0,777
 02270 210,210,430,169,64,0,0,0,0,0,0,0,76,1,0,0
 02280 130,130,360,162,49,0,0,0,0,0,0,0,76,2,0,0
 02290 90,90,300,170,27,0,0,0,0,0,0,0,76,3,0,777
 02300 225,200,330,170,69,0,0,0,0,0,0,0,76,1,0,0
 02310 200,165,300,122,61,0,0,0,0,0,0,0,76,2,0,0
 02320 173,162,303,143,53,0,0,0,0,0,0,0,76,3,0,777
 02330 7900,6800,20500,9200,2400,0,0,0,0,0,0,0,76,1,0,0
 02340 7481,6873,19163,8736,2309,0,0,0,0,0,0,0,76,2,0,0
 02350 4600,4600,17430,9700,1420,0,0,0,0,0,0,0,76,3,0,777
 02360 1069,469,660,330,328,0,0,0,0,0,0,0,76,1,0,0
 02370 720,250,210,116,222,0,0,0,0,0,0,0,76,2,0,0
 02380 465,280,250,250,145,0,0,0,0,0,0,0,76,3,0,777
 02390 142,165,554,34,44,0,0,0,0,0,0,0,76,1,0,0
 02400 115,105,290,60,35,0,0,0,0,0,0,0,76,2,0,0
 02410 105,50,264,24,32,0,0,0,0,0,0,0,76,3,0,555
 02420 2601,2404,3103,1255,800,0,0,0,0,0,0,0,77,1,0,555
 02430 2560,2350,3054,961,790,0,0,0,0,0,0,0,77,2,0,555
 02440 2700,1900,2550,1200,630,0,0,0,0,0,0,0,77,3,0,555
 02450 619,542,642,187,190,0,0,0,0,0,0,0,77,1,0,555
 02460 540,494,452,122,166,0,0,0,0,0,0,0,77,2,0,555
 02470 339,295,300,140,100,0,0,0,0,0,0,0,77,3,0,555
 02480 360,325,110,54,111,0,0,0,0,0,0,0,77,1,0,555
 02490 223,130,50,47,68,0,0,0,0,0,0,0,77,2,0,555
 02500 165,85,40,40,50,0,0,0,0,0,0,0,77,3,0,555
 02510 840,750,355,90,256,0,0,0,0,0,0,0,77,1,0,555
 02520 105,82,189,70,33,0,0,0,0,0,0,0,77,2,0,555
 02530 0,0,0,0,0,0,0,0,0,0,0,0,77,3,0,555
 02540 2296,1776,2767,1319,895,0,0,0,0,0,0,0,5,77,1,0,555
 02550 2400,1500,1940,1027,740,0,0,0,0,0,0,0,5,77,2,0,555

02560 1640,885,1340,1007,505,0,0,0,0,0,5,77,3,0,555
 02570 2421,1727,2312,1102,750,0,0,0,0,0,6,77,1,0,555
 02580 2350,1499,1809,830,724,0,0,0,0,0,6,77,2,0,555
 02590 1709,1100,1550,1050,525,0,0,0,0,0,6,77,3,0,555
 02600 469,327,448,214,148,0,0,0,0,0,7,77,1,0,555
 02610 275,173,203,147,85,0,0,0,0,0,7,77,2,0,555
 02620 240,140,220,185,74,0,0,0,0,0,7,77,3,0,555
 02630 700,510,668,319,215,0,0,0,0,0,8,77,1,0,555
 02640 675,505,565,305,209,0,0,0,0,0,8,77,2,0,555
 02650 455,343,400,259,140,0,0,0,0,0,8,77,3,0,555
 02660 857,539,818,398,264,0,0,0,0,0,9,77,1,0,555
 02670 409,258,320,230,123,0,0,0,0,0,9,77,2,0,555
 02680 29,11,17,17,6,0,0,0,0,0,9,77,3,0,555
 02690 335,229,329,145,100,0,0,0,0,0,10,77,1,0,555
 02700 220,130,163,97,60,0,0,0,0,0,10,77,2,0,555
 02710 104,69,100,47,31,0,0,0,0,0,10,77,3,0,555
 02720 1727,1626,2698,1616,530,0,0,0,0,0,11,77,1,0,555
 02730 660,783,1345,368,203,0,0,0,0,0,11,77,2,0,555
 02740 490,615,1082,1032,156,0,0,0,0,0,11,77,3,0,555
 02750 1370,365,2400,1270,420,0,0,0,0,0,12,77,1,0,555
 02760 813,561,1494,746,250,0,0,0,0,0,12,77,2,0,555
 02770 703,449,1071,842,216,0,0,0,0,0,12,77,3,0,555
 02780 973,611,1264,746,390,0,0,0,0,0,13,77,1,0,555
 02790 900,555,1200,720,278,0,0,0,0,0,13,77,2,0,555
 02800 695,561,920,584,127,0,0,0,0,0,13,77,3,0,555
 02810 270,210,200,172,83,0,0,0,0,0,14,77,1,0,555
 02820 145,115,60,40,43,0,0,0,0,0,14,77,2,0,555
 02830 220,175,60,40,68,0,0,0,0,0,14,77,3,0,555
 02840 985,675,2070,980,395,0,0,0,0,0,15,77,1,0,555
 02850 1640,640,3020,1476,595,0,0,0,0,0,15,77,2,0,555
 02860 690,475,1440,699,220,0,0,0,0,0,15,77,3,0,555
 02870 250,250,430,195,0,0,0,0,0,0,16,77,1,0,555
 02880 130,130,390,181,40,0,0,0,0,0,16,77,2,0,555
 02890 35,35,250,200,25,0,0,0,0,0,16,77,3,0,555
 02900 245,215,359,200,75,0,0,0,0,0,17,77,1,0,555
 02910 219,190,300,183,65,0,0,0,0,0,17,77,2,0,555
 02920 175,164,306,155,54,0,0,0,0,0,17,77,3,0,555
 02930 5450,9359,21500,10600,2700,0,0,0,0,0,12,77,1,0,555
 02940 8121,7132,20283,9326,2500,0,0,0,0,0,16,77,2,0,555
 02950 4600,5100,17200,10500,1420,0,0,0,0,0,15,77,3,0,555
 02960 1262,554,760,400,338,0,0,0,0,0,19,77,1,0,555
 02970 375,393,252,126,270,0,0,0,0,0,19,77,2,0,555
 02980 400,260,250,250,125,0,0,0,0,0,19,77,3,0,555
 02990 164,237,644,114,51,0,0,0,0,0,20,77,1,0,555
 03000 124,113,313,89,38,0,0,0,0,0,20,77,2,0,555
 03010 115,93,274,54,35,0,0,0,0,0,20,77,3,0,555
 03020 0,0,0,0,0,0,0,0,0,0,78,0,0,999

TABLE XXV
CORPORATE PROFIT AND LOSS DATA

<u>Line #</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
1	0	0	0	0	0
2	1500	1750	1000	1300	1600
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0.5	0.5	0.5	0.5	0.5
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	1	2	3	4	5

TABLE XXVI

CORPORATE SPECIFICATIONS DATA

<u>Line #</u>	<u>Description</u>	
1	Discount factor s (Management established value equal to the pre-tax cost of capital to the firm)	<u>0.15</u>
2	Dividends as a fraction of net profit after tax	<u>0.20</u>
3	Maximum debt to equity ratio	<u>0.60</u>
4	Minimum current ratio (must be greater than 1)	<u>1.50</u>
5	Minimum cash as a fraction of other beginning current assets	<u>0.10</u>
6	Effective interest rate pre-tax on long and short term debt	<u>0.07</u>
7	Return on corporate investments pre-tax	<u>0.08</u>
8	Maximum acceptable dilution from equity sales (as a fraction of the current year's earnings/share)	<u>0.10</u>
9	Number of times old earnings/share for which new equity can be raised	<u>5</u>
10	Blank	<u>0</u>

TABLE XXVII

ARBITRARILY ASSIGNED THREE-POINT PROBABILITY
DISTRIBUTIONS USED WITH THE
PROBABILISTIC INVESTIGATIONS

Number	Lower ¹ Point	Probability of Lower Point	Probability of Given Point	Upper Point	Probability of Upper Point
1	.8	.3	.6	1.1	.1
2	.7	.3	.6	1.2	.1
3	.6	.2	.6	1.3	.2
4	.8	.4	.4	1.2	.2
5	.8	.4	.4	1.1	.2
6	.8	.4	.5	1.2	.1
7	.7	.2	.7	1.1	.1
8	.7	.4	.4	1.1	.2
9	.7	.5	.4	1.1	.1
10	.7	.1	.8	1.1	.1
11	.7	.1	.8	1.2	.1
12	.6	.3	.5	1.2	.2
13	.6	.3	.6	1.3	.1
14	.6	.1	.8	1.3	.1
15	.6	.2	.7	1.3	.1
16	.8	.3	.5	1.1	.2
17	.8	.2	.5	1.1	.3
18	.8	.2	.6	1.1	.2
19	.7	.3	.5	1.1	.2
20	.6	.4	.5	1.2	.1

Average of the means of all distributions = 0.9435

Average of the variances of all distributions = 0.025

¹ As a fraction of the given point which is the value used in the deterministic input.