VALUATION METHODS AND THE USE OF COMPUTERS IN THE ACQUISITION ANALYSIS OF PRIVATELY OWNED FIRMS

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ABSTRACT

The main economic justification for mergers and acquisitions is the creation of an entity whose market value is greater than the sum of the values of the merging firms considered as separate entities. Among the problems facing a corporation in evaluating a merger candidate is that of determining the price to be offered. The problem is compounded when the firm to be acquired is a privately-held corporation whose shares are not traded in the market.

This thesis suggests that the process of premerger valuation be structured in such a way as to allow explicit and separate valuation of the fair market value of the firm to be acquired, and of the synergistic benefits expected to accrue as a result of the merger. The analysis is limited to those benefits which are financial in nature.

In the course of the thesis, we first illustrate some of the methods and techniques that are available for evaluating non-public firms with explicit consideration given to the uncertainties involved. We then examine the financial impact of the issues in price negotiations, such as media of exchange, type of transaction, schedule and forms of payment, and related tax implications. We develop an application of goal programming to the problem of structuring the securities package to be used as payment. Drawing upon this background of methods and techniques, we then present a framework of analysis and provide practical guidelines to establish a maximum price to be paid for an acquisition.

Last, we investigate the general use of computers in support of merger analysis. We first present a survey of computer programs which have appeared in the literature or which we have obtained from other sources. We conclude by presenting and illustrating the use of an interactive program which was developed to aid the decision-maker in structuring a transaction package consistent with several of his operational and financial goals.

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TABLE OF CONTENTS

Section	Title				Page
Chapter I	Introduction				14
Chapter II	Fair Market Value: Valuation Methods				20
	A.	Net Assets Valuation Approach			23
	B.	Market Valuation Approach			26
	C.	Valuation of Potential Cash Flows			29
		1.	Discounted Cash Flow Technique		30
			1.1	Cash Flow Projections	30
			1.2	Terminal Value	32
			1.3	Discount Rate	37
			1.4	Present Value of Cash Flows	43
		2.	Certainty Equivalent Technique		44
		3.	Probability Distribution Analysis		47
Chapter III	Value to the Buyer: Valuation Methods				52
	A.	Total Cash Flow Analysis			54
	B.	Synergism: A Framework of Analysis			59
		1.	Benefits		61
		2.	Costs		64
		3.	Discount Rates		66
			3.1	Determination of RV2	67
			3.2	Determination of ΔRV3	68
		4.	Price of the Acquisition		69

TABLE OF CONTENTS (Cont.)

Section	Title			Page
Chapter IV	Other Factors in Determining the Acquisition Price			72
	A.	Earnings Per Share		73
		1.	The Chain Letter Effect	73
		2.	Short-Term Dilution	75
		3.	Long-Term Dilution	77
	B.	R.O.I.		88
	C.	Diversification		92
Chapter V	Forms of Payment			104
	A.	Type of Transaction: Purchase and Reorganization		105
		1.	Purchase	106
		2.	Reorganization	107
	B.	Tax Implications in Merger Negotiations		110
	C.	The Contingent Contract		113
		1.	Contract Types	114
		2.	Advantages and Disadvantages	116
Chapter VI	Acquisition Analysis: A Procedural Framework			119

TABLE OF CONTENTS (Cont.)

Section	Title			Page
Chapter VII	Structuring the Merger Package			129
	A.	The Nature of Goal Programming		131
	B.	Goal Programming Applied to Merger Packaging Analysis		137
		1.	Transaction Constraint	140
		2.	Short-Term EPS Dilution Constraint	141
		3.	Ownership Goal	143
		4.	Solvency Goal	144
		5.	Earnings-Per-Share Growth Goal	145
		6.	Net Working Capital Goal	148
		7.	Objective Function	149
	C.	Linearization of Penalty Functions		158
		1.	EPS Dilution Penalty Function	158
		2.	Ownership Penalty Function	162
		3.	Solvency Penalty Function	168
Chapter VIII	The Use of Computers in Merger Analysis			173
	A.	Introduction		173
		1.	Characteristics of Merger Analysis	174
		2.	Advantages and Disadvantages of Computer Analysis	175

TABLE OF CONTENTS (Cont.)

Section	Title			Page
	3.	Characteristics and Differences of Available Programs		177
B.	The Available Programs			179
	1.	The MCKINSEY Program		179
	2.	The QUICKSCAN Program		191
	3.	MERGERESTIMATOR		194
	4.	The REALSCAN Program		203
	5.	The PROSIM Program		212
	6.	The PRODEP Program		221
	7.	The Corning-Glass Works (CGW) Program		228
	8.	The COMMAND Program		232
		8.1	PASTFLOW	232
		8.2	CASHPLAN	233
		8.3	EDIT	233
		8.4	PRODPLAN	233
		8.5	MERGE	234
		8.6	TARGET	234
	9.	The RAYTHEON Program		236

TABLE OF CONTENTS (Cont.)

Section			Title	Page
	C.		The Relationship of the Programs to Our Framework of Analysis	239
		1.	Projection of the Acquisition's Future Cash Flows	239
		2.	Determination of the Acquisition's Fair Market Value	240
		3.	Adjustements to the Maximum Price Before Taxes	241
	D.		Comparison of Programs	242
Chapter IX	The FUSION Program			243
	A.		A Note on Time-Sharing Acquisition Analysis	244
	B.		Introduction to FUSION	246
	C.		Using FUSION	248
	D.		Evaluation of FUSION	251
Chapter X	Summary and Conclusion			254
Appendix A	Adjusted P/E Valuation Method			258
Appendix B	Factors Affecting the P/E Ratio			271

TABLE OF CONTENTS (Cont.)

Section	Title	Page
Appendix C	Determination of a Discount Rate: The Cost of Capital	275
Appendix D	Risk-Equivalent Rate of Return	283
Appendix E	Alphabetical List of Acronyms Used	293
Appendix F	The QUICKSCAN II Program	295
Appendix G	A Sample Session Using FUSION	304
Bibliography		345

LIST OF TABLES

Table No.	Title	Page
2-1	Terminal Value	34
3-1	Applicability of Discount Rates	69
8-1	Exhibit 1 - Current and Projected Data	181
8-2	Exhibit 2 - Financial Picture of Superior Tree Before Acquisitions	182
8-3	Exhibit 3 - Superior Acquiring a Typical Home Building Company in 1969, 1970, and 1971	184
8-4	Exhibit 4 - Financial Projections for Deluxe Homes	184
8-5	Exhibit 5 - Superior Tree Acquiring Deluxe Homes in 1969 - Share Data	186
8-6	Exhibit 6 - Superior Tree Acquiring Deluxe Homes in 1969 - Financial Statements	188
8-7	Sample Output Page from QUICKSCAN	193
8-8	Sample Output of MERGERESTIMATOR	198
8-9	Sample Output of MERGERESTIMATOR	199
8-10	Sample Output of MERGERESTIMATOR	201
8-11	Sample Session with REALSCAN	206
8-12	Conversation with PROSIM Program	216
8-13	Conversation with PRODEP Program	225
8-14	Functional Features of the Various Programs	242

LIST OF FIGURES

Figure No.	Title	Page
2-1	Certainty-Equivalence Curves	45
4-1	Risk-Return Scatter Diagram	102
7-1	Graph of the Function $c(Z^+)$	155
7-2	Earnings-Per-Share Dilution Function	159
7-3	Ownership Dilution Function	163
7-4	Debt-to-Equity Function	168
7-5	Piecewise Linearization of the Solvency Penalty Function	169
8-1	Cumulative Probability Distribution Function	213
D-1	Linear Risk-Return Assumption	289
D-2	Rejectability Area Under No Capital Rationing	290
D-3	Rejectability Area Under Capital Rationing	291

LIST OF FLOWCHARTS

Flowchart No.	Title	Page
1	A Framework of Analysis	124
2	Market Valuation - Adjusted P/E Method	125
3	Market Valuation - Discounted Cash Flow	126
4	Value to the Buyer	127
5	Market Valuation - ROI Approach	128

CHAPTER I

Introduction

When two companies combine assets in exchange for securities and only one company survives (although the other still exists as an operating entity), the transaction is called a merger. If a new company is formed, there has been a consolidation. When one company is purchased by another and completely absorbed, so that the selling company no longer exists, an acquisition has taken place. In practice, these definitions tend to become blurred, and the terms are usually used interchangeably.

Why do companies merge? A general answer cannot be provided. Companies take the merger and acquisitions route for several reasons. Growth is probably the most common reason. Expansion through acquisition of other companies may be quicker than internal growth, may prove less costly in the long run, and may decrease potential competition as well. A company may improve its financial position by acquiring firms with unutilized borrowing capacity, or with losses which can be recovered through tax carry-overs. Others seek the achievement of operating economies through the consolidation of certain departments (accounting, marketing, clerical) and of production facilities. Closely related to operating economies is the acquisition of management, as a route to obtain an aggressive team which may foster the long run wealth of the stockholders. A merger may improve a company's marketing position by reducing its reliance on a particular type of customer, and stabilize the cyclical nature of its business.

Different as they may appear, all of these motives strive towards the attainment of a common objective: the creation of an entity whose market value is greater than the sum of the values of the merging firms considered as separate entities. This phenomenon, known as synergy, is central to the economic justification of mergers and acquisitions.

Among the problems facing a corporation in evaluating a merger candidate is that of determining the price to be offered. This price may be viewed as the sum of the candidate's fair market value plus a premium justified by the extra benefits generated by the merger and accruing to the stockholders of the corporation. Different companies may assess differently the value of these benefits. This explains why a range of prices rather than a single value may be placed on the same assets.

Therefore, it will be suggested in the course of this thesis, that the process of premerger valuation be structured in such a way as to allow explicit and separate valuation of the fair market value of the firm to be acquired, and of the synergistic benefits expected to accrue as a result of the merger.

There are, of course, a number of nonfinancial factors which must be taken into account, such as personnel, image, entry in new markets, and technological considerations. Because some of these factors may defy quantification, our analysis will be limited to those which are of a financial nature.

The purpose of this thesis is (i) to illustrate some of the methods and techniques that are available and have been used in the evaluation of firms for acquisition purposes, (ii) to present, drawing upon this background, a framework of analysis and provide practical guidelines to establish a maximum price to be offered for an acquisition, (iii) to examine the financial impact of some of the issues involved in price negotiations, such as media of exchange, type of transaction, schedule and forms of payment, and related tax implications, (iv) to investigate the general use of computers in support of merger activities, (v) to illustrate an interactive program developed to assist the manager in structuring a financial package consistent with several operational and financial goals.

The scenario that we have chosen is that of a publicly traded holding company buying a privately-held corporation. We, therefore, develop our analysis under the assumption that there does not exist a market price for the shares of the firm to be acquired. We further assume that the acquired business after the acquisition will be run as an independent entity. This will allow us to restrict the analysis of synergism to those benefits which are financial in nature, although the proposed framework will be general enough to take operational benefits into consideration as well.

We would have liked to avail ourselves of more data about valuation techniques than we were able to collect and examine. The difficulty of uncovering such information, as employed by companies involved in the process of merger and acquisitions, or in consulting, was underestimated. Firms, are, as we have found, rather secretive about the methods that they employ in valuation analysis.

Following is an outline of this thesis.

In Chapter II, we examine three methods of evaluating the fair market value of a firm: asset valuation, market valuation and the valuation of potential cash flows. In Appendix A, we present an example of an implementation of the market valuation analysis through the adjusted P/E method. Rather than determining a single price, the value of the firm will be bounded within a range of values. In Chapter III, we introduce a framework for evaluating the acquisition from the buyer's point of view. This will lead us to the explicit evaluation of the net benefits available from the merger and to a technique for comparing and selecting investments which are in a different risk class from that of the acquiring firm. Appendices C and D deal with the practical issue of determining the appropriate discount rates and describe the concept of risk-equivalent rate of return.

In Chapter IV, we consider some of the other factors that usually enter the acquisition analysis and which may ultimately have an impact on the determination of value. We specifically expound on the use of earnings per share dilution and ROI as valuation criteria in premerger analysis. Furthermore, in looking at the acquisition as part of the investment portfolio of the acquirer, we consider the issue of diversification and the benefits which may be thereby derived.

In Chapter V we recognize that the psychological and economic expectations of the seller have a large impact on negotiations. In practice, the expectations of the seller can be met by structuring the deal in a way consistent with those expectations. Tax considerations, the type of transaction, the financial package to be offered are briefly considered as means available to the buyer to affect negotiations.

In particular, the use of contingent contracts is seen as a helpful approach to bridge the gap that may separate the buyer and the seller with respect to their individual assessment of fair terms of exchange.

In Chapter VI, we suggest a procedural framework to be used to work through the analysis of a prospective acquisition candidate. This model represents a synthesis of the techniques and methods described in the course of this thesis.

Chapter VII follows with an application of goal programming to the problem of structuring a financial package. The technique allows the decision-maker to explore several combinations of financial packages and choose the one that comes closest to satisfying his several internal goals as well as meeting the seller's requests.

Chapter VIII presents the results of our survey of computer programs which have been developed over the last years and which support in some way or another the process of financial merger analysis.

In Chapter IX, we present a preliminary version of our own interactive computer program, designed to aid the decision-maker structure a merger package in accordance with several specified goals.

Finally, in Chapter X we present a brief conclusion on our work and provide suggestions for further research and developments.

CHAPTER II

Fair Market Value: Valuation Methods

Since 1954, federal tax regulations have specified the use of fair market value in corporate tax returns. This term has become the basis of value used in valuing corporations.

Fair market value is generally defined as:

> . . . the price at which property would change hands between a willing buyer and a willing seller, each having reasonable knowledge of all pertinent facts and neither being under compulsion to buy or sell[1].

According to this definition, the fair market value (FMV) of a corporation relates to the value of its ownership, and therefore, corresponds to the market value of its equity. Stated in other terms, FMV is a measure of a firm's total market value less the market value of any outstanding debt. In mathematical terms, this may be summarized as:

$$FMV = E = V - D$$

Therefore, in order to determine FMV, it is possible to either (i) determine E directly or (ii) determine V and substract D. Although

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[1]John Heath, Jr., "Valuation Factors and Techniques in Mergers and Acquisitions", <u>Financial Executive</u>, April 1972, pp. 34-43.

both approaches are quite similar from a computational viewpoint, they are conceptually different. In the first case, the firm is valued from the equity holders standpoint, and, therefore, only the benefits accruing to the firm's shareholders are taken into consideration. In the second case, the company is first viewed globally, and correspondingly, all of its cash flow (flows to the shareholders plus interest payments to the debt holders) enter the determination of V; E is then determined by substracting from V the market value D of the debt outstanding. If the valued firm is unlevered (all equity) both approaches are identical. It is worth noticing that the capital structure of the firm is taken into account by both approaches.

In the course of this chapter, we shall examine the three valuation methods which are most commonly used to determine the FMV of a firm:

i. The Net Asset Valuation Method proceeds to establish the value of the whole enterprise and of each of its principal elements, in proper relationship to each other and to the whole. This value, net of any long-term debt, determines the firm's fair market value.

ii. The Market Valuation Method assigns a FMV to a company by submitting it to a comparison with similar public companies in the same industry grouping.

iii. The Valuation of Potential Cash Flows Method determines a firm's value by discounting into the present the firm's estimated future stream of cash flows.

To the extent that each valuation approach may yield a different value, these may be viewed as providing a reasonable range for the firm's fair market value. The lowerbound of this range can be considered to be the net liquidating value of the company's assets.

In what follows, we examine each of these valuation approaches.

A. Net Asset Valuation Approach

The importance of asset valuation can be illustrated through a simple consideration. Assume that two companies are exactly alike, both in terms of their operating statements and their balance sheets. Do the two companies necessarily have the same fair market value? Clearly not.

An in depth analysis of the value and type of assets to be acquired can provide a much clearer picture of the worth of the business. "The economic worth of any given asset is not the amount of its original cost less accumulated depreciation, but rather an estimate of how much better off the business is at a certain date for having it. Therefore, value must be ascertained by studying income stream and potential obsolence factors, market forces and current replacement costs." [2]

Hence, rather than accepting book value as representing the true economic value of the assets of the seller, one should have the assets appraised in order to establish their fair market value.

The Accounting Principle Board, in Opinion 16, suggests general guidelines for assessing the fair market value of assets and liabilities. Establishing these values usually requires that adjustements be made to the book values at which these assets appear on the seller's balance sheet.

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[2] John M. Parker, "The Key Role of Property Appraisals in Mergers and Acquisitions," Financial Executive, September 1972, p. 20

These adjustements having being made, one can compute the asset value of the enterprise using the simple formula suggested by Heath:[3]

$$E = WC + PP + I$$

in which WC represents working capital, PP represents plant and property and I represents intangibles. In the same article, Heath also provides a useful checklist of the principal classes of assets in each category. The above formula gives a going concern value of the firm. Alternatively, one can also compute the liquidation value. This value is arrived at by taking the fair market value of the assets and liabilities and applying appropriate adjustements to more closely reflect the realizable value that might be obtained under a forced sale situation. Liquidation value is important as it provides the appraiser with a lower bound to the range of possible prices that he might want to consider.

There are additional reasons which suggest careful evaluation of the assets of the seller:

1. The value of the assets provides an indication of the borrowing capacity that will be available if the assets are used as collateral for bank loans.

2. Knowledge of the remaining useful life of the assets allows forecasting future capital outlays required in support of operations.

[3] Heath, op. cit.

3. For tax avoidance purposes, the owners of closely held corporations tend to accumulate earnings within the corporate shell. These appear in assets which are not essential to the operations of the business. These assets can, therefore, be liquidated, thus effectively reducing the purchase price of the acquisition.

4. In many cases, appraisals can motivate the basis for a shift in the emphasis for negotiations: the possibility of buying the assets, rather than the entire business, might be brought into the open.

Moreover, one must consider the accounting method that will be applied to record the transaction on the books of the combined entity, as this will ultimately determine the kind of liabilities or tax shelters that one may obtain from carrying those assets.

The Net Asset Value of the firm is finally determined by subtracting from the computed Asset Value the market value of any long-term liabilities.

B. Market Valuation Approach

When the company to be acquired is a publicly held company and its stock is traded over an active exchange, there exists a strong inclination to value such company on the basis of the market price of its shares. In other words, even though one might have reason to believe that current market price is not representative of the intrinsic value of the firm, it may be politically and psychologically quite difficult for either buyer or seller to be convinced that the company is worth anything more or less than the market value of its shares.

In the case of a closely held company, the stock is not traded in the open market. However, because in the long-run the market place tends to provide a much more reliable indication of the intrinsic value of the firm, one can make use of publicly available information on companies in the same industry and of similar size and risk class to evaluate by comparison the fair market price of privately held corporations.

The process of selecting comparable corporations and computing significant indicators to be applied as a valuation guide, is needless to say, a complex problem and a highly judgemental exercise. Besides selecting companies that have comparable trends in growth and income and a comparable capitalization structure, one has to make sure that the accounting practices of the companies used in this comparison do not distort the earnings or assets picture. If any differences can be disclosed, adjustments should be made to eliminate undesired impacts.

The object of this search is to find a class of similar firms by looking at various ratios which are selected as being of primary importance in the valuation of the particular situation.

The first knotty issue has to do with the selection of standard ratios appropriate to the company's state of development, seasonal patterns, etc. Important sources of average ratios for a given industry can be found in Dunn and Bradstreet's, Moody's and Standard and Poor's Manuals. Alternatively, trade associations records may come handy. Finally, ratios can be computed directly from data in annual reports of companies in the same industry. Several limitations in the use of these ratios have been enumerated:

1. Only numerical items are being evaluated.

2. Management can influence those ratios.

3. Different accounting practices in depreciation, income recognition intangible assets, etc. may be misleading.

4. Different definitions of common ratios is given by different analysts.

But given that standards have been selected and computed, the second issue becomes, what relative weighing do you give to each ratio? Some ratios will relate to the profitability of the business, others to its liquidity, others to its financial structure and to the risk profile;

still others to the assets available, or to the capability of paying out dividends. The relative weighing becomes a matter of preference and can best be treated by making individual assessment and measuring their direct consequences in terms of the outcomes. Adjustements can be made to reflect lack of comparability, lack of marketability and almost anything the appraiser cares to quantify in order to deal with the uncertainties involved.

This approach is extensively used by investment bankers in pricing of new issues: the value of a company is established mainly in relation to other companies in the market place. It should be noted how, given the difference in objectives between going public and selling out, the value given to the stock may ultimately be different. In the going-public case, one is essentially concerned with establishing the value at which average blocks of minority shares will be traded. In the case of an acquisition, a premium over and above the market value of the shares is usually paid to reflect the added value of control.

In Appendix A, we provide a description and an example illustrating how the market valuation technique is actually implemented by valuation practicioners.

As may be observed, the Market Valuation Technique establishes the Fair Market Value of a firm by directly assessing the value of its equity.

C. Valuation of Potential Cash Flows

The fundamental characteristics of business assets is that they give rise to income flows. Sometimes this flow is easy to determine and measure; at other times, the cash flows attributable to the assets must be estimated. However, regardless of the difficulties of measuring income flows, it is the prospective revenues from assets that give them value.

In determining the fair market value of a firm, it is, therefore, essential to estimate and value the cash throw-offs expected to occur over future years. The process becomes increasingly difficult as the degree of certainty with which the receipts can be forecasted decreases.

Several valuation techniques have been developed to value an asset on the basis of the expected stream of its future cash flows. From a conceptual viewpoint, all of them require that

i. Future cash flows be estimated.

ii. The uncertainty inherent to these flows be ascertained.

iii. The value given to the stream of estimated cash flows be adjusted to reflect the uncertainties involved.

Whilst the conceptual framework used is the same, what differentiates the various techniques is the way in which uncertainty is treated. In what follows, we shall describe the three main techniques which are presently used to value the potential cash flows of an asset.

i. Discounted Cash-Flow (DCF) Technique

ii. Certainty Equivalent Technique

iii. Probability Distribution Technique

1. Discounted Cash Flow (DCF) Technique

This procedure, alternatively denoted as the capitalization-of-cash flows method of valuation, involves (i) estimating the future net cash flows[4] attributable to the firm, (ii) determining a terminal value to represent all cash flows expected to accrue beyond a selected horizon date n, (iii) selecting the capitalization or discount rate r that most appropriately takes the uncertainty of the cash flows into account, and (iv) determining the present value of the stream of cash flows (using the selected rate as the discount rate). Mathematically, this is expressed as:

$$P = \sum_{t=1}^{n} \frac{\text{CASH FLOW}_t}{(1 + r)^t} + \frac{\text{TER VALUE}}{(1 + r)^n}$$

1.1 Cash-Flow Projections

In order to estimate future cash flows, an analyst must generate pro-forma cash flow statements for all years up to a defined horizon year, and determine a terminal value to be used as a proxy for all those cash flows expected to accrue beyond the chosen horizon

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[4]By "net cash flows" we intend: expected earnings after taxes and interest + depreciation - required investments.

year. To do this, the analyst must forecast future income, working capital, capital expenditures, depreciation and all other items affecting cash flow. The greatest problem lies with the assessment of earnings over time. In order to forecast future earnings, he must first become familiar with historical performance data as available through past operating statements of the company. From this analysis, he tries to determine why the past record was what it was. As the conditions that created the past trend become understood, the analyst must then question whether these conditions are likely to persist in the future. If they are, projections can be made based on this assumption; otherwise, the impact of foreseeable changes must be estimated and incorporated in the forecasts. The process is invaluable in forcing the analyst to take into consideration the many variables that can influence the particular business. Since the entire approach is based on valuing future events, which are uncertain at best, one should look at a range of possible values rather than at a single value. The greater the uncertainty, the larger will be the spread between the most optimistic and pessimistic forecast.

Various mathematical models are available to represent future growth in earnings under all kinds of different assumptions (such as constant stream, growth at historic average rate, constant growth in each year or time-varying rates of growth).

Statistical techniques can be of help in analyzing past data. Industry projected data can be usefully tapped in looking at future growth potential, but when a company operates in more than one industry, this may pose serious identification problems. Several methods of performing analysis of growth can be found in classical books of investment analysis[5], and it is beyond the scope of our work to cover this analysis. In practice, the process of projecting earnings requires a contribution from marketing, production and finance people. The marketing people will forecast sales, prices, selling expenditures; the production people will estimate plant requirement and manufacturing costs on the basis of projected sales; the finance experts will incorporate these estimates and translate them into projected earnings and finally, pro-forma cash-flow statements can be generated.

1.2 Terminal Value

The analyst must make a decision regarding the time horizon over which the cash flows are simulated, and forecast the terminal value that can be attributed to the company at the end of the time horizon period. The time horizon should be set as far out into the future as the analyst feels he can make reasonable predictions. A minimum useful projection period seems to be five years. Many managers would argue that the level of uncertainty is such that they feel

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[5] J. B. Cohen, E. D. Zinbarg, Investment Analysis and Portfolio Management, Irwin 1967.

incapable or unwilling to make projections much beyond a year or two. But the same managers might feel quite comfortable in recommending a buy decision on such basis, thereby committing long-term resources to a project whose return is undefined beyond the first year or two.

The terminal value is used as proxy for the cash flow generated by the business far into the future, when it becomes too difficult to model relationships or assess probabilities.

Terminal value can take on a critical role in establishing a market value for a given venture. It is particularly important in high-potential ventures, where the investor is looking for large capital gains in selling out the company, after having operated it for a few years. Because during this time the net cash flows may be negative in every year, the return can only come from a higher P/E multiple attached to the terminal value. In the context of an acquisition, the assumptions made about this value can have a large impact on the decision of whether or not to go ahead with the acquisition.

Several models can be used for assigning a terminal value. One can have the terminal value be a specified market value at the end of the horizon. Alternatively, one can assume simple cash flow patterns, such as constant cash flow in each year following the horizon date, or a compound growth rate or any combination of the two. In Table 1[6], we have reproduced six models of assigning a terminal value.

[6] Prof. J. S. Hammond III, Teaching Note 4-172-273, Harvard Business School, 1972.

Table 1

Six Models for Terminal Value

(See definition of symbols at bottom of page)

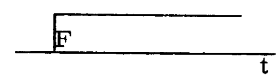
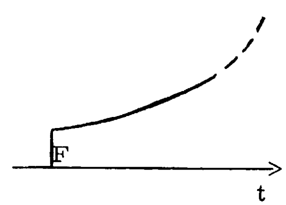
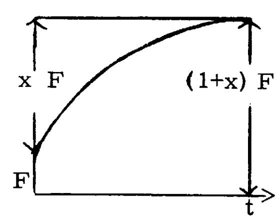
	Description	Graph of Cash Flows After Horizon Date	Formula For Terminal Value	Example
1.	Steady cash flow at rate F perpetually.		$T = \frac{F}{1}$	$i = 10\%$ $\boxed{T = \frac{F}{.1} = 10xF}$
2.	Compound growth at annual rate g.		$T = \frac{F(1+g)}{i-g}$ $\quad i>g$	$i = 10\%$ $g = 5\%$ $\boxed{T = 21 \times F}$
3.	Asymptotic growth Increment each year is fraction k of the distance remaining to the target.		$T = F\left[\frac{(1+x)k}{i} + \frac{1-k}{i+k}\left(\frac{k(1+x)}{i} + 1\right)\right]$	$i = 10\%$ $k = 5\%$ $x = 1$ $\boxed{T = 13.65 \times F}$

Table 1 (Cont.)

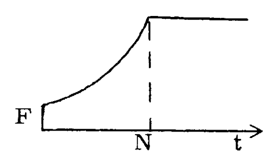
Description	Graph of Cash Flows After Horizon Date	Formula For Terminal Value	Example
4. Steady cash flow with survival probablity p in each year	See 1	$T = \dfrac{Fp}{1 + i - p}$	$i = 10\%$ $p = .95$ $\boxed{T = 6.32 \times F}$
5. Compound growth with survival probability p in each year	See 2	$T = \dfrac{Fp(1 + g)}{1 + i - p(1+g)}$ $1>g$	$i = 10\%$ $g = 5\%$ $p = .95$ $\boxed{T = 10 \times F}$
6. Compound growth for N years after the horizon date - Steady cash flow thereafter		$T = F\left\{\left[1 - \left[\frac{1+g}{1+i}\right]^N\right]\left[\frac{1+g}{1-g}\right] + \frac{1}{i}\left[\frac{1+g}{1+i}\right]^N\right\}$	$i = 10\%$ $g = 5\%$ $N = 5$ years $\boxed{T = 12.06 \times F}$

Table 1 (Cont.)

Symbols

F = annual cash flow at terminus of project

g = compound growth rate of cash flow

i = discount rate

N = number of years of compound growth preceeding steady cash flow (pattern 6)

T = terminal value

$1 + x$ = multiple of long-run cash flow to original in asymptotic growth situation

1.3 Discount Rate

The rate used to discount into the present the projected stream of cash flows can be viewed as consisting of two elements. The first corresponds to a measure of the time value of money, and is usually taken to be the risk-free rate, i. The second component corresponds to the premium, over and above the risk-free rate, usually required to induce the investor to take on risk. The risk premium can be further broken down into two components: a premium for business or operating risk β, and a premium for financial risk ϕ. The first is caused by the inherent risk of doing business in a given industry, i.e., by the relative dispersion of the probability distribution of possible future operating income. The second, the premium for financial risk, reflects the volatility in earnings available to the stockholders of a firm, as well as the probability of insolvency, which is a function of the firm's degree of leverage.

The discount rate can thus be viewed as being the sum of three factors[7]:

$$r = i + \beta + \phi$$

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[7] Van Horne, op. cit., pp.

This rate represents the minimum rate of return required by investors for investing in the firm. In Appendix B, we have provided a list of factors which may affect both the operational and the financial risk premiums.

The main source from which an estimate of the appropriate discount rate can be obtained is the securities market for stocks of companies operating in the same industry. Of the several techniques available for estimating r^* from the market, we will comment on the DCF approach, mathematical probabilistic models and simulations.

The basic rationale for looking at the stocks of companies operating in the same industry grouping as the firm being valuated is that at any point in time, securities are so priced that all securities within the same risk class offer the same expected rate of return. Moreover, stock prices reflect the present value, discounted at r^*, of the stream of expected dividends D_t, i.e.,

$$P_o = \sum_{t=1}^{\infty} \frac{D_t}{(1 + r^*)^t} \qquad (2.1)$$

The idea, therefore, is to estimate what investors expect in the way of future dividends, and infer r^* from the observed price P_o. r^* is the rate of return that investors demand, on the average, for investing in that industry. Although the concept is clear enough, important problems emerge in estimating the size and time pattern of the stream of benefits. Moreover,if the evaluated firm cannot be viewed as a typical firm within its industry, r^* will not represent an unbiased estimate of the rate of return on investment r that investors may require to invest in that firm.

This will lead us to a second-level problem, namely: what adjustements to r^* should we make to match the perceived differences of operating or financial risk that the firm may present relative to the average firm in its industry? In what follows, we will first discuss possible ways of estimating r^* and we will then proceed to consider how r^* can be adjusted to obtain r.

In order to aid in the resolution of these problems, Equation (2.1) can be written as[8]:

$$P_o = \frac{EPS_1}{r^*} + \sum_{t=1}^{\infty} \frac{D_t - EPS_1}{(1 + r^*)^t} \tag{2.2}$$

where the second term on the right-hand side can be interpreted as the net present value of future growth opportunities. With Equation (2.1) so expressed, a number of simplifications are usually made in order to obtain estimates of r^*. Firstly, if the dividend stream is

[8] Stewart C. Myers, "The Application of Finance Theory to Public Utility Rate Cases", The Bell Journal of Economics and Management Science, Vol. 3, No. 1, Spring 1972.

assumed to continue to grow indefinitely at some rate g, which is less than r^*, Equation (2.2) simplifies to:

$$P_o = \frac{D_1}{r^* - g}$$

from which r^* is obtained as:

$$r^* = \frac{D_1}{P_o} + g \tag{2.3}$$

Secondly, if it is assumed (i) that earnings per share (EPS) in any one year are representative of "normal" long-run earnings of the firm, (ii) that all earnings are paid out as dividends, and (iii) that the firm's net present value of future investments is zero (all investments yield exactly r on the average), Equation (2.2) resolves to:

$$r^* = \frac{EPS_1}{P_o} \sim \frac{1}{P_o/EPS}$$

Because of the simplicity of this formula, and ease of obtaining values for P_o and EPS, the value for r^* thus determined has found widespread use as the appropriate rate of return required by investors. We wish to point out, however, that because of the assumptions made, this value generally underestimates the actual rate of return which investors may require for investing in a particular industry. To this extent, the inverse of the P/E ratio of an industry should be used with caution and awareness of its implications when trying to estimate the appropriate discount rate for an industry.

The problem of adjusting r^* to match any peculiarites of the firm being evaluated with respect to its industry, does not have a general solution. In practice, r is determined by adjusting upward or downward the industry's rate of return r^* to denote any amount of operating risk and/or financial risk, above or below the firm's industry averages. These adjustements for risk yield what is usually referred to as the risk-adjusted discount rate.

The techniques which aid in adjusting r^* to the firm's proper risk level, focus on those factors which may affect the rate of return required by investors (see Appendix B), and make adjustements on r^* by comparing the firm's specific attributes to those of its industry's (see Appendix A).

When probabilistic and simulation models are used to obtain estimates of r, the future volatility of cash flows or of the operating variables which affect cash flows is captured in mathematical terms[9] and compared with the inherent uncertainty of returns of the equity shares of companies operating in the same industry. This comparative analysis, in turn, leads to the estimation of an appropriate discount rate.

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[9] We dwell with these models in the following section.

In conclusion, the risk-adjusted discount rate, as may be estimated from a comparison with other firms in the same industry, has a great deal of intuitive appeal; it makes sense to shoot for a higher rate of return when a firm's risk characteristics are above the industry average, and to do the opposite when the firm's future returns are less risky.

According to this rule of thumb, the higher the risk, the higher the discount rate, and the lower the fair market value to be attributed to the firm. Because this concept is simple and provides for the incorporation of individual risk preferences, its use has already gained wide acceptance as a valuation and capital budgeting technique. The main shortcoming of the approach, however, stems from the difficulty of determining the discount or capitalization rate which correctly compensates for a firm's risk deviations from its industry's average. This has lead many firm's and analysts to use a single and unnecessarily high discount rate for their investment and capital budgeting needs.

Other disadvantages of the risk-adjusted discount rate approach are:

i. Because the selection of the risk-adjusted discount rate is somewhat subjective, it is possible that the analyst may not make consistent choices.

ii. Robichek and Myers[10] have illustrated how the use of a constant discount rate for every year actually implies an increasing time pattern for risk. Because in the vast majority of business situations, the further the returns, the more likely they are to increase in uncertainty, the use of a constant risk-adjusted rate may actually be appropriate. Nevertheless, the amount of this increase is not directly specifiable by the analyst.

1.4 Present Value of Cash Flows

The fair market value of the firm is finally determined by discounting, at the risk-adjusted rate r, the estimated stream of cash flows and the terminal value. Mathematically, this is expressed as:

$$P = \sum_{t=1}^{n} \frac{\text{CASH FLOW}_t}{(1+r)^t} + \frac{\text{TER VALUE}}{(1+r)^n}$$

We remind the reader that CASH FLOW_t represents expected earnings after taxes and interest plus depreciation less required investments in period t.

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[10] A. A. Robichek and S. C. Myers, Optimal Financing Decisions, Prentice Hall, 1965, pp. 83.

2. Certainty Equivalent Technique

Given the limitations of the discount rate technique, the certainty equivalent approach has been offered as a more realistic and theoretically more powerful alternative to deal with risk[11]. The procedure consists in adjusting the numerators of the DCF formula to yield for each period what the manager perceives as a certainty equivalent cash flow. That is, all estimated cash flows are multiplied by a coefficient that converts the uncertain cash flow to one equivalent sum of money which the manager would be indifferent to receive with certainty, in lieu of the uncertain cash flows. The certainty equivalents are then discounted to the present value using the riskless rate as the discount rate to avoid double counting risk.

This approach may be expressed as:

$$PV = \sum_{j=1}^{\infty} \frac{\alpha_t \ \text{CASHFLOW}_j}{(1+i)^j} \qquad (2.4)$$

where α_t, the certainty equivalent coefficient for period t, varies between 0 and 1, inversely with the degree of risk. More precisely, α_t is the coefficient that, in each period, makes the manager indifferent between the certain cash flow A_t^* and its risky counterpart A_t, i. e.:

$$\alpha_t = \frac{A_t^*}{A_t}$$

[11] Idem., p. 80

The certainty equivalent coefficient can be specified to be different in each period, thereby easily compensating for time-varying degrees of perceived risk.

The maximum fair market value to be attributed to a firm is equal to its present value, as computed in Equation (2.4)

The use of this technique is predicated on the manager's ability to represent the market's "trade-off" between certain cash flows and progressively riskier ones. The locus of such "trade-offs" defines what is generally denoted as a set of certainty equivalence curves, which are graphed in Figure 2.1.

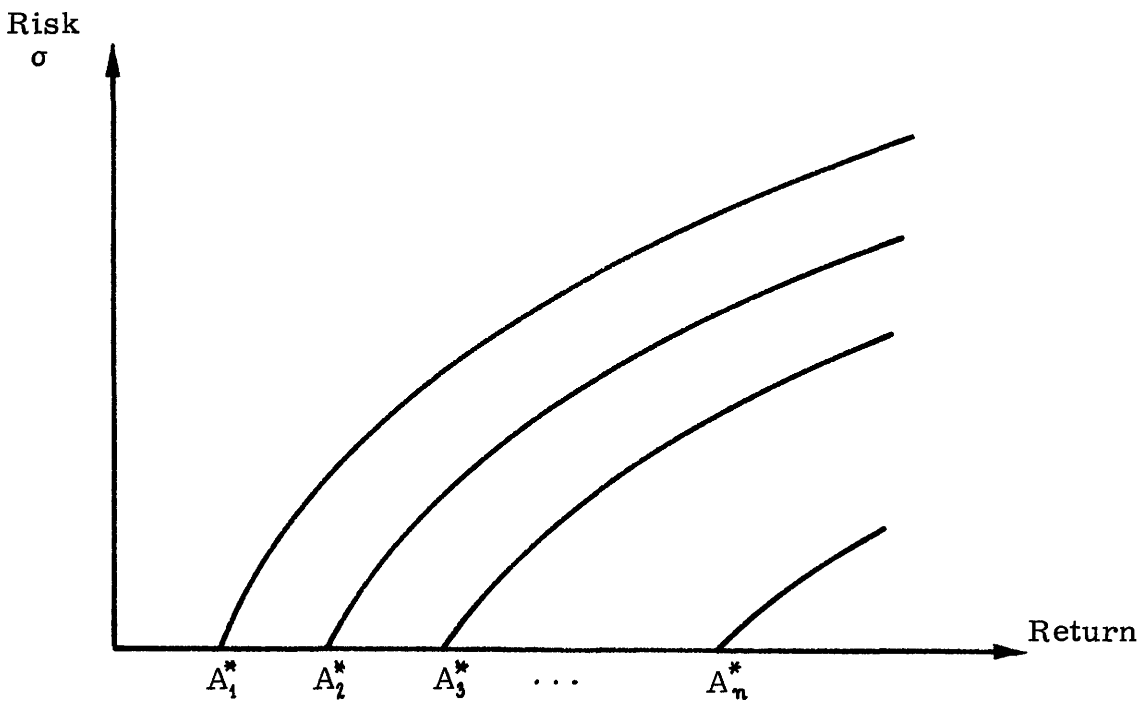

Figure 2-1

According to this graph, we can arrive at the certainty equivalent of any point lying above the X-axis ($\sigma \neq 0$), by seeing where the certainty equivalent curve that passes through the point intersects the X-axis ($\sigma = 0$).

The disadvantage of the technique resides in the fact that in most cases, it is difficult to give α_t sufficient empirical meaning to make them useful in practice. Moreover, the technique is rather cumbersome insofar as it requires the user to select an α_t for each period; if cash flows vary over a large range, the number of certainty equivalency curves to be constructed, assuming that they can be specified, would in any case be very large. On the other hand, the method makes it possible to value firms and rank them according to their expected profitability.

3. Probability Distribution Analysis

Both the risk-adjusted discount rate and the certainty equivalent coefficients to be used in discounting the future cash flows of an investment are determined by taking the variability, thus the risk, of these cash flows into consideration. Thereafter, a single value for each past period is selected and the present value of the project is calculated deterministically as a single point estimate. A more powerful model for dealing with the uncertainty of a project, considers the probability distribution of each flow and computes the resulting probability distribution of net present values, to yield a complete profile of the possible final outcomes. In describing an investment through a probability curve of its future outcomes, the decision-maker has available an explicit graphical representation of the variability of the returns from the project. Using this information, the riskiness of the investment can be evaluated much more realistically than by focusing on a single number.

The probability distribution of any variable can be characterized using two parameters, its expected arithmetic mean and standard deviation. Unless one makes specific assumptions, the shape of the distribution is not univocally determined: a skewness parameter should also be specified in order to exhaustively characterize the distribution curve. With normal distributions, the mean μ and standard deviation σ completely describe the distribution, which has the characteristic bell shape.

The expected value of the present value of a series of independent[12] cash flows A_o, A_1, . . ., A_n, each having an expected value $E(A_t)$ is:

$$E(PV) = \sum_{t=1}^{n} \frac{E(A_t)}{(1+i)^t}$$

$$\sigma(PV) = \left[\sum_{t=1}^{n} \frac{\sigma_t^2}{(1+i)^{2t}} \right]^{1/2}$$

The appropriate discount rate to be used is the riskless rate. To make use of a higher rate would actually result in double counting the risk of the expected returns.

Furthermore, the dispersion of E(PV) can also be calculated as the present value of each period's σ_t, discounted at the riskless rate. This, however, may be interpreted as implying the existence of a time preference for risk. Although we cannot provide an answer to this question, it would seem that if risk is to be discounted at all, the usage of a higher discount rate would underestimate the present value of the

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[12]There are a few investments for which the net cash flows are completely independent of each other. If we assume each cash flow A_t to consist of a component A_t' which varies independently and a component A_t'' which is directly proportional to the A'' of its preceding period, the standard deviation of the PV of A_t's is given by:

$$\sigma = \sum_{t=1}^{n} \frac{\sigma^2(A_t')}{(1+i)^{2t}} + \left[\sum_{t=1}^{n} \frac{\sigma\,(A_t'')}{(1+k)^t} \right]^2$$

For an expansion on this point, see J. T. Mao, <u>Quantitative Analysis of Financial Decisions</u>. The MacMillan Company, 1969, p. 276.

expected cash flows' standard error of return[13].

When dealing with normal distribution functions, each $E(A_t)$ is equal to the arithmetic mean μ_t of its pertinent distribution. Furthermore, to the extent that the sum of n normally distributed random variables is itself a normally distributed random variable, each A_t is normally distributed, E(PV) will also be normally distributed. Throughout this thesis, for purposes of simplicity, we shall assume normality and independence for the cash flows generated by a firm.

Once the E(PV) and σ(PV) have been computed for the future cash flows of a firm, it is possible to compute its fair market value through the certainty-equivalent approach.

Alternatively, a simpler approach which avoids the problem of specifying a series of certainty equivalent curves, consists in using the market's risk-return trade-off curve to determine (i) the probability index p_m required on investments of riskiness σ(PV), and (ii) the fair market value V3 such that

$$\frac{E(PV) - V3}{V3} = p_m$$

Solving for V3 yields:

$$V3 = \frac{E(PV)}{1 + p_m}$$

[13]Weston and Brigham use the risk-adjusted discount rate for this purpose. See Weston and Brigham, op. cit., p. 249

The shortcoming of the probability assignment approach is that it requires the market risk-return indifference curve to be specified. However, in contrast with the certainty equivalence approach, only one curve has to be defined. This curve can be constructed by plotting on a scatter diagram a series of risk-rate of return combinations as found in the securities market and by fitting through the points a least square second degree polynominal.

Conceptually, the major advantage of this method is that it provides the analyst with a complete spectrum of possible present values, rather than with a single number.

When the conditions of independence and normality do not hold, it is useful to use probability trees and simulation models to derive probabilistic estimates of future cash flows. Hillier[14], Hertz[15] and Magee[16] have extensively dealt with these situations.

Because these approaches generally involve extensive computations, their practical use has been limited. With the increasing use of computers as an aid to management decision-making, these techniques are becoming more and more applicable.

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[14] See Frederick S. Hillier, "The Derivation of Probabilistic Information for the Evaluation of Risk Investments", Management Science, IX (April 1963), pp. 443-57.

[15] David B. Hertz, "Risk Analysis in Capital Investments", Harvard Business Review XLII (Jan.-Feb. 1964), pp. 95-106.

[16] John F. Magee, "How to Use Decision Trees in Capital Investment", Harvard Business Review, XLII (Sept. -Oct. 1964), pp. 79-95.

Hertz, for instance, makes use of Monte Carlo simulations to derive probability distributions of future net cash flows from management's estimates of individual operational variables (sales, expenses, depreciation, etc.).

In conclusion, we suggest the fair market value of the firm be determined as a range of prices arrived at by using the three basic techniques illustrated in this chapter. Each technique provides a different perspective. Correspondingly, the past, present and future performance of the acquisition cnadidate are given due consideration in an attempt to provide better insight than could otherwise be gained by reporting to any one technique in isolation.

Several ways of estimating the uncertainty of future cash flows have been presented. Even though in the following chapters we will not make explicit use of these techniques, we shall assume the decision-maker will choose among them the most appropriate one to assess risk as he perceives it.

CHAPTER III

Value to the Buyer: Valuation Methods

There is more to the valuation of a prospective acquisition than merely computing its fair market value. If that were the maximum price worth paying for the acquisition, there would be no real point to the merger. In fact, it is because the acquisition's value as part of the buyer's assets is generally greater than its fair market value, that the prospect of merging the two entities is economically more advantageous than operating the two firms independently. This is the essence of synergism.

The potential synergistic benefits to be gained from an acquisition may be quite diverse, including but not limited to: economies of scale, increased market share, elimination of inefficiences in the acquired firm, diversification, better use of funds and new investment opportunities, increased earning per shares, better management, tax advantages, etc.

In order to capitalize on most of these benefits, it is usually necessary to proceed towards a substantial integration of the operations of the two firms. For other benefits, however, primarily financial in nature, a minimal degree of integration is necessary.

To the extent that the main focus of this thesis is on the financial aspects emerging in acquisitions, we shall limit our discussion on synergistic effects to those that are financial in nature.

In the first section of this chapter, we use the DCF technique, as described in the previous chapter, to assess the impact of the acquisition's estimated total cash flows upon the acquirer and thereby derive the maximum price to be offered for it. The estimates of cash flows embody the synergistic benefits involved in the merger.

In the second section, we present a framework of analysis which leads to the determination of the maximum price to be offered for the acquisition by focusing primarily on the cash flows expected to be generated from the synergistic effects resulting from consolidation. The present value of these benefits is then added to the fair market value of the seller in order to determine the maximum price.

Throughout this chapter we shall make no explicit use of the probabilistic techniques described in section C of Chapter II to deal with the uncertainty of cash flows. In practice, however, in order to consistently assess the risk inherent in various investments, the decision-maker should make recourse to those techniques.

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A. Total Cash Flow Analysis

In the previous chapter, we presented the DCF technique as one of the most pragmatic methods for computing the fair market value of a firm. The same technique can be used by the acquirer to evaluate, from his viewpoint, the stream of total cash available from the prospective acquisition (i.e., the expected cash flows from the acquisition on a "stand-alone" basis plus those which will derive from any synergistic effects).

Because the acquirer will be able to modify the capital structure resulting from the merger, the valuation analysis should attempt to measure the expected earning power of the total assets of the acquisition, apart from considerations of financial structure. In other words, the acquisition should be evaluated as an unlevered firm, and thereby only in the light of its expected cash flows and operational risk. To this extent, the definition given in Section C of Chapter II to "cash flows" needs to be modified to reflect the fact that the prospective cash income from the acquisition must be estimated before interest charges.

The appropriate measure of cash flow to be used in any given period is, therefore, the total amount that will be available to the acquirer, that is,total expected earnings after taxes (but before interest), plus depreciation less any investment required in that period. We may write this as:

$$\text{CASH FLOW}_t = \text{EBIT}_t (1 - T_c) + \text{Dep}_t - I_t$$

The "discount rate" to be used in discounting the estimated stream of cash flows must be the minimum rate of return that the investment should earn to leave the value of the acquiring firm unchanged. Mathematically, this is expressed as:

$$dA = dV$$

where

dA = purchase cost of assets acquired

dV = change in the acquirer's market value.

This point relates to the concept of cost of capital, which is the cost paid by the firm for funds acquired from the capital markets. Different size and type of firms (i. e., public versus closely-held) have different costs of capital, even if the operating risk of the projects they invest in is the same. In particular, a public company will ceteris paribus, generally have a lower cost of capital than a closely-held corporation, because of the higher liquidity it offers its investors and the lower risk resulting from having to operate in conformance to SEC regulations.

To this extent, in determining the appropriate capitalization rate to use in discounting the total cash flows which will become available to the buyer as a result of the merger, it is important to address the issue of what impact the acquisition will have upon the risk inherent to the acquirer's returns on equity prior to the merger.

Two cases are possible: either the acquisition's assets fall in the same risk class as those of the acquirer, or they do not.

In the first case, the appropriate discount rate to be used is the acquirer's weighted average cost of capital, as defined in Appendix C:

$$\rho_1 = (1 - T_c)\, i_1 \frac{D}{E + D} + r_1 \frac{E}{E + D}$$

where the subscript 1 indicates the purchasing firm.

In the second case, when the prospective acquisition falls in a different risk class, one should use the risk-equivalent rate of return ρ' as derived by Tuttle and Litzenberger and defined in Appendix C:

$$\rho_1' = (1 - T_c)\, i_1 \frac{D'}{E' + D'} + r_1 \frac{E'}{E' + D'}$$

where $D'/(E' + D')$ and $E'/(E' + D')$ are the weights according to which the acquisition must be financed if r_1 is to remain unchanged. This mode of financing poses no restrictions on the way the acquisition is actually paid for, provided, however, that the required financial mix is reached subsequently through appropriate amounts of borrowing or lending. We expand on the risk-equivalent approach in Appendix D.

Having thus defined cash flows and the appropriate discount rates to be used, the present value of the stream of total expected cash flows from the acquisition can be computed to obtain its maximum value.

However, because this value has been obtained by assuming the acquisition candidate to be unlevered, the maximum purchase price to be offered is obtained by substracting from this value any outstanding debt and obligations that the seller may have and that which the acquirer will assume.

The shortcoming of using the total cash flow approach is that the synergistic aspects of the merger are being considered as part of a single stream of cash generated from the assets of the firm.

This poses two problems. Firstly, the incremental benefits deriving from the merger are not explicitly isolated. As a result, the acquirer may fail to gain enough insight into what is actually being gained by proceeding with the merger. Secondly, because all cash flows are lumped together and only one discount rate is used, no explicit[1] recognition can be given to the fact that certain cash flows will have different degrees of uncertainty.

[1]Depending on how the acquirer perceives the risk attached to the synergistic cash flows, the discount rate can be adjusted upward or downward to reflect his attitude.

These deficiencies indicate that it would seem more appropriate to isolate the synergistic and other cash flows, and use for each stream a risk-differentiated discount rate.

In the following section, we will illustrate a framework of analysis which proceeds to determine the maximum price to be offered for the acquisition in this manner.

B. Synergism: A Framework of Analysis[2]

If we assume that Firm 1 is considering acquiring Firm 2 and if we take RV1 to accurately reflect the fair market value[3] of Firm 1, and RV2 to represent the fair market value of Firm 2, then the real value RV3 of the combined entity will be equal to:

$$RV3 = RV1 + RV2 + \text{Present value of synergistic benefits} \quad (3.1)$$

In looking at the benefits and the costs pertaining to a possible acquisition, we will use the following definitions:

Benefits: the difference between (1) the total present value of the merged firm and (2) the sum of their values if they do not merge.

$$\text{Benefits} = \Delta RV3 = RV3 - (RV1 + RV2) \quad (3.2)$$

Costs: the difference between the amount paid for the acquired firm and what it is worth as a separate entity. That is, the "premium" paid for the acquisition.

[1]The main ideas and the framework of analysis presented in this section have been provided by Prof. S. C. Myers in "Evaluating Mergers and Acquisitions", Sloan School of Management Teaching Note, June 1971.

[2]As in Chapter II, the fair market of a firm is here defined to represent the market value of its equity.

Cost = Premium = PRICE - RV2

Usually, in evaluating a merger, firms are used to equate the cash outlay to the total stream of cash flows available from the acquisition (including those of a synergistic nature). This, in fact, was the approach followed in Section A. Conversely, in the proposed framework, the manager is asked to evaluate separately the cash flows available from Firm 2 as if it continued to operate independently, and the present value of the incremental benefits that are expected to be available, given that the two firms will be merged together. For this reason, it is convenient to define cost as only that part of the payment which does not cover the fair market value of the firm. Similarly, benefits are defined as the dollar value that measures the degree to which two firms are worth more together than apart. The main rationale behind this approach is to bring the synergistic aspects of the merger into sharper focus and thereby provide the acquirer with a better understanding of what premium over the fair market value he may offer for the acquisition.

We will now proceed to elaborate on the relevant benefits and costs, reminding the reader of the fact that Firm 1, in our specific case, is a publicly-traded firm and Firm 2 is a closely-held corporation.

1. Benefits

The major benefits that may accrue to Firm 1 are:

1. Excess debt capacity available in Firm 2.

2. Liquidation of excess cash or unprofitable assets.

3. Better access to funds: lower financing charges.

4. Additional investment opportunities in new lines of business.

5. Diversification

6. Tax Benefits

7. Operational Benefits

8. Intangibles (image, entry in new markets, management, etc.)

In the present value calculations, the cash flows from financial benefits will generally have to be discounted at the acquirer's borrowing rate, whereas the cash flows derived from operations should be discounted at the appropriate risk adjusted discount rate. If we exclude "Intangibles" which defy quantification, only "Operational Benefits" and "Additional Investments" would be regarded as falling in the class of operational benefits; all other benefits are financial. We will further expand on the use of separate discount rates in Section 3.

In what follows, we describe how to compute the dollar value of the benefits and the costs.

i. Excess Debt Capacity

The value of unused debt capacity is equal to the after-tax interest payments on the additional portion of debt that can be issued, discounted at the borrowing rate (i.e., the present value of the potential tax shelter).

ii. Excess Assets

If the liquidation value of any asset which is either not essential or unprofitably used is over and above its net present value to the firm, the asset can be liquidated and the value of the firm be increased by the difference.

iii. Lower Financing Charges

The benefit accruing to the combined entity is going to be at least the difference between the borrowing rate for the combined firm and the rate at which the seller could borrow at, times whatever amount of financing is anticipated by the needs of the acquired firm[4].

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[4]Several studies have shown that within an industry the cost of equity funds tends to decrease with the size of a firm. This effect, however, has been found to be of minor importance. See Merton H. Miller and Franco Modigliani, "Some Estimates of the Cost of Capital to the Electric Utility Industry", American Economic Review, June 1966, pp. 339-340.

iv. Additional Investments

If the acquisition opens up new possibilities for subsequent capital investments, then the stream of cash after tax less the stream of new investments, discounted at the risk-adjusted discount rate should be considered as an additional benefit accruing from the merger.

v. Diversification

It is the differential benefit accruing to the firm for taking on a project which lowers the overall risk of the firm. The benefit is measured by the difference in price that would be paid considering the project in the portfolio of the firm's investments, as opposed to in isolation.

Given that Firm 2 is a closely-held corporation and if Firm 1 stockholders would not otherwise be able to avail themselves of the diversification benefits provided for by Firm 2, diversification affects may be quite relevant to our analysis. In Chapter IV, we devote a whole section to this subject.

2. Costs

In principle, the overall benefit from a merger is the present value of the synergistic cash flow available for reinvestment. The present value of this benefit should be compared to the cost incurred to obtain it.

Cost has been defined as the premium paid, i.e., the difference between the payment for acquiring the firm and what the firm is worth as a separate entity:

$$\begin{aligned} \text{Cost} &= \text{Value of assets paid to 2 by 1} - \text{Real Value 2} \\ &= \text{PRICE2} - \text{RV2} \end{aligned}$$

The likely cost of a proposed acquisition varies depending on the type of transaction to be adopted. For the cases where cash or stock are used as transaction media, the costs are:

i. Financing with Cash

In this case, the cost is simply the premium paid over the acquisitions fair market value:

$$\text{COST} = \text{CASH} - \text{RV2}$$

ii. Financing by Stock

The apparent cost is the premium paid over the fair market value of the acquired firm:

$$\text{Apparent Cost} = NSI * P1(0) - RV2$$

where NSI is the number of shares issued and P1(0) is the market value of one share of Firm 1 at the time the deal is considered.

However, this is not likely to be the real cost, because: (i) the market price of the shares P1(0) could be over or understated; (ii) a portion of the benefits generated by the merger will now accrue to shareholders of the acquired company. Therefore, the true cost is:

$$\text{True Cost} = \beta * RV3 - RV2$$

where

$$\beta = \frac{NSI}{NOS1 + NSI}$$

and

NOS1 = number of shares outstanding in Firm 1

NSI = number of shares issued

and $\beta * RV3$ indicates the real value of that portion of the merged firms received by the shareholders of 2.

3. Discount Rates

In this section, we attempt to be more specific about the discount rates to be used in the evaluation of the cash flows available to the buyer as a result of the acquisition. In so doing, we will make use of formulas presented in Appendix C.

Let us rewrite Equation (3.2) as:

$$RV3 - RV1 = RV2 + \Delta RV3 \qquad (3.2a)$$

This relationship expresses the differential value between the combined entity (RV3) and the buying firm (RV1) as the sum of the intrinsic value of the acquired firm (RV2) plus the incremental benefits (ΔRV3) available from the merger. The right-hand side of (3.2a) thus represents the total present value of the acquisition. In order to compute this value, we will, therefore, evaluate RV2 and ΔRV3 independently using different discount rates, as appropriate.

3.1 Determination of RV2

There are three different ways in which we can determine RV2.

a. The first method corresponds to that used in Section A, where we looked at the firm from the point of view of the investors in the market place and, therefore, considered only the cash flows available to the equity holders, i.e.,

$$\text{CASH FLOW} = \text{EAIT} + \text{Depr} - \text{Invest}$$

The appropriate discount rate to be used in this case is the risk-adjusted market rate of return r_2.

b. Alternatively, a second method considers the total stream of cash flow expected to accrue from the firm's assets independently of capital structure considerations, (hence after taxes but before interest), i.e.,

$$\text{CASH FLOW}_t = \text{EBIT}_t\,(1 - T_c) + \text{Depr}_t - \text{Invest}_t$$

and discount it at the weighted average cost of capital of that firm.

$$\rho_2 = (1 - T_c)\, i_2 \frac{D_2}{E_2 + D_2} + r_2 \frac{E_2}{E_2 + D_2}$$

c. Thirdly, RV2 may be determined by using the Adjusted Present Value (APV) method (described in Appendix C). Accordingly, RV2 is determined as the sum of the value of the unlevered firm (the firm assumed to be all-equity financed) and the present value of the tax shelters provided by the firm's debt. The appropriate discount ratio to be used in this case are ρ_{02} for the stream of operational cash flows, i.e.,

$$\text{CASH FLOW}_t = \text{EBIT}_t(1 - T_c) + \text{Depr}_t - \text{Invest}_t$$

and i for the tax shelters

$$\text{TAX SHELTER}_t = i\, T_c\, D_t$$

3.2 Determination of ΔRV3

In determining the present value of the synergistic cash flows, it is necessary to distinguish between the several sources giving rise to these incremental benefits, and use for each stream a discount rate reflecting accurately its associated degree of risk. Accordingly, one may use:

i. i_1, the borrowing rate of Firm 1, for the financial benefits.

ii. ρ_{o2}, the cost of equity of Firm 2 when considered unlevered, for any operating benefits. Recall that ρ_{o2} may be derived from Firm's 2 cost of capital ρ_2 by using the M-M relationship:

$$\rho_2 = \rho_{o2} (1 - T_c D/V)$$

or by using

$$\frac{(r - i)\, \rho_{o2}}{(r - \rho_{o2})i} = \frac{\text{EBIT}}{\text{I}} = \text{times interest earned}$$

as derived in Appendix D.

4. Price of the Acquisition

The maximum price to be paid for the acquisition, short of the evaluation of intangibles, may finally be determined as:

$$\text{PRICE2} = \text{RV2} + \text{PV benefits} \tag{3.3}$$

By looking at Equation (3.2), we observe that if the negotiated price equals RV2, Firm 1 has available the total value of the benefits at 0 cost. If the price equals RV2 + ΔRV3, then all synergistic benefits accrue to the seller. In between these bounds, the benefits from the merger are shared between both seller and buyer.

Throughout this chapter, only tangible factors have been brought into the analysis. To the extent, however, that prior to the final decision on the maximum price to be offered, intangibles usually play a considerable role, we may expect the ultimate price to be adjusted in a subjective manner.

(continued on page 72)

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CHAPTER IV

Other Factors in Determining the Acquistion Price

There are many variables and many conditions that management may want to satisfy in establishing the price and the means of exchange to be used in acquiring another business. These variables, when taken globally into consideration, may contribute to the determination of value. However, they do not per se indicate value.

Management is generally faced with a multiplicity of objectives that it wishes to attain. In practice, it will, therefore, define a primary objective and aim at satisficing the others. These subgoals may range from retaining a given percentage of ownership, to maintaining a certain dividend payout ratio, from limiting short-term dilution in earnings per share, to observing a given debt to equity ratio. In fact, at any particular point in time, any one of these subgoals may become a goal in its own right, as opposed to being merely regarded as a guidepost.

This has been the case with the controversial and widely debated use of earnings per share dilution as a primary performance criteria in merger activities. In the first section of the present chapter, we will be looking at this issue in some detail.

In the second section, we will be commenting on the use of ROI as one among other commonly used criteria for evaluating investments.

Finally, we will consider the goal of diversification. In so doing, we will cease to look at the riskiness of an acquisition as an isolated investment, rather we will view the firm to be acquired as part of the portfolio of existing investments whose overall return is to be made less volatile.

A. <u>Earnings Per Share</u>

In the present section, our objective is to gain some perspective into this concept in order to suggest that EPS should not be regarded as a primary goal, but rather be used as one of several criteria, useful in bounding the price of an acquisition. Furthermore, we will provide and illustrate the use of a formula that can be used to determine the maximum price per share, which should be paid for a non-public firm, given that the buyer requires no EPS dilution by a specified year.

1. <u>The Chain Letter Effect</u>

There is a strong interest among those publicly held companies which seek growth through acquisitions to have the highest possible market price accrue to their stock. This is because these companies usually make use of their common as currency with which to buy other companies. It follows that the higher the price of the stock, the fewer the shares which need to be issued to pay for a given acquisition and the lesser percentage of ownership that has to be given up to the new shareholders. One should further consider that the smaller the total number of shares outstanding after an acquisition, the higher the earnings per share. Obtaining an immediate increase in earnings per share from an acquisition has two advantages. First, with no change in the P/E multiple, the price of the stock goes up in proportion to the increase in earnings per share. Secondly, since P/E ratios are favorably influenced by a rising earnings trend, if the acquisition improves the earnings per share picture, it is reasonable to expect an increase in the P/E that the market attributes to the stock. This would again proportionally increase the price of the stock.

With a high P/E, a "growth" company can maintain its image of growth by making successive financial acquisitions, even though the acquired companies have themselves limited growth prospects.

This is the so-called "chain letter" or "bootstrapping" effect, which was at the basis of the conglomerate game back in the twenties. As long as companies with lower P/E ratios than the P/E of the purchaser are acquired, an immediate improvement in EPS for the combined entity results. The company may thereby enjoy an increase in the price of its stock, which would further enhance new acquisition prospects. Hence the interest in the short term impact of the acquisition on the price of their stock of most companies involved in external growth.

Already in the twenties, this tactic proved to be a very dangerous one, and many of the companies that tried to play the same game in the sixties, found that it did not work any better then. The reasons which account for the failure of this short-sighted approach to acquiring firms are covered in what follows.

2. Short-Term Dilution

The rationale for avoiding short-term dilution stems from the empirical observation that the market place seems to overdiscount future earnings in the presence of short-term dilution, at least in the immediate aftermath of the consolidation. This constraint has traditionally posed severe limitations as to the type of companies that can be acquired. Companies with excellent long-term prospects usually command a high P/E multiple and even though future earnings, on a net present value basis, may more than compensate for the short-term diluting effects, the deal is not considered. In fact, it is precisely because too much emphasis has been put on short-term impact that future earnings have suffered and many conglomerates have therefore found their long-run viability severely impaired.

In recent years, the "myth of dilution" has been attacked by several financial experts[1].

At stake is the fact that management has full responsibility of its shareholders and cannot disregard either the short-term or the long-term impact of the investments that it decides to make. Therefore, avoiding short-term dilution in earnings should at least not prevent management from taking on situations with good long-term potential. Let us consider the case of a company with a low P/E ratio and presumably low growth, trying to acquire a company with higher growth prospects and commanding a higher multiple. A large number of shares would have to be swapped for a relatively small number of earnings, thus diluting the earnings of the acquiring company by more than the desired amount. In the face of a very desirable situation, if long-term earnings for the combined company show the desired growth rate, a financial package could then be devised that minimizes the risk of present stockholders in the short-run also.

If available, cash can be used to pay for the acquisition; alternatively, the cash needed may be raised through a debt or equity issue. This medium of exchange would of course force the acquired company to pay capital gains tax, which the seller

[1] J. F. Weston, The Determination of Share Exchange Ratios in Mergers, The Corporate Merger, W. W. Alberts and J. E. Segall, Univ. of Chicago Press, 1966

might have to cover through a commensurate increase over the purchase price that he would pay in a stock for stock swap. Issuance of non-voting stock, such as common preferred, will also avoid dilution, but again the seller would have to pay capital gains tax on the transfer, since only the exchange of voting stock istreated as a tax-free exchange. Issuance of convertible debentures or convertible preferred will in many cases allow a tax-free exchange and avoid immediate dilution.

To achieve similar objectives, contingent payment contracts can be an ideal compromise. With this technique, a downpayment of stock is made at the time of closing the deal and further payouts are made conditional upon future earnings of the acquired company.

One final possibility is the installment sales agreement, whereby the buyer agrees to pay no more than 30 percent of the total agreed upon price in the initial year of the acquisition. This has certain tax advantages for the seller, as capital gains taxes may then be paid on contingent payments as they come due.

3. Long-Term Dilution

We have so far discussed how short-term dilution of EPS should be considered by management a guidepost rather than an objective. We have also noted how enough flexibility exists in structuring the financial package to overcome most of the undesired short-term dilution problems.

We must now turn to the use of this guidepost as an indicator of long-term growth in the earnings of the overall corporation. Specifically, we have in mind the long-term dilution effects that may result from the merger if the acquired does not meet the same earnings goals planned for the consolidated entity. This concept is covered very effectively by Fray-Ackerman[2], with the introduction of what they call the "diversification gap".

On the assumption that a firm's acquisition program is, as it should be, closely related to the attainment of clearly identified corporate objectives, and on the assumption that growth in EPS is a fundamental measure of economic performance, then "the EPS growth objectives provides the firm with a way of planning acquisition activities for the long term".[3] The difference between the objective and the expected earnings growth from current businesses (internal growth) over the planning period constitutes a diversification gap. Each potential acquisition can be evaluated in terms of its contribution to closing that gap with its future stream of earnings. A long-run

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[2] L. L. Fray, R. W. Ackerman, Financial Evaluation of a Potential Acquisition, Financial Executive, October 1967.

[3] Idem.

dilution occurs if in the planning horizon year the earnings per share issued (EPSI) for the acquired company are below the earnings per share that the corporation has established as its target for the planning horizon year. Unless this happens, the diversification gap will not decrease. This long-term dilution constraints set a ceiling on the price that can be paid for acquiring the business.

The article provides a clear example of how, if the shares issued to acquire the business earn anything short of the target EPS for the corporation as a whole, the diversification gap will widen.

Let us assume that purchaser P expects earnings from his current business to grow at 8 percent per year for ten years from the present level of $2/share; 5 million shares are currently outstanding and the price per share is $36 (P1). Its objective is to have a 10 percent growth in EPS over the next ten years. The diversification gap (Div. Gap) is computed as follows:

At target growth rate of	10%	EPS (10) = 2.594 * $2 = $5.19
At the expected growth rate	8%	EPS (10) = 2.159 * $2 = $4.32
		Δ = $0.87

Div. Gap = $.87/share * 5 M shares = $4.35M

So P in the tenth year will see its earnings per share $.87 short of target and a resulting gap of $4.35M in profits.

Let us assume now that in an effort to reduce this gap, P acquired company S's 800,000 shares at $24 per share and it does so by issuing:

$$\$24 * 800{,}000/\$36 = 533{,}333 \text{ shares}$$

of its own common stock.

If S earnings are $800,000, each share issued by P will earn $800,000/533,333 = $1.50/share. S is expected to have a growth rate of 12 percent; the present earnings of $800,000 will grow from $1.50 to $4.66 per share.

The earnings per share for the combined company will recover from an initial dilution of $0.05 and in the tenth year will be $4.36 rather than $4.32 per share, as evidenced by the following calculations

EPS post merger in Year 0

$$\frac{5{,}000{,}000 * \$200 + 533{,}333 * \$1.50}{5{,}533{,}333} = \$1.955/\text{sh}$$

EPS in 10th year

$$\frac{5{,}000{,}000 * \$4.32 + 533{,}333 * \$4.66}{5{,}533{,}333} = \$4.36/\text{sh}$$

In spite of this improvement in EPS for the overall corporation, the diversification gap has actually increased!

$$\Delta = (\$5.19 - 4.36) = \$.83/\text{share}$$

$$\text{Div. Gap} = \$.83/\text{sh} * 5{,}533{,}333 \text{ shares} = \$4{,}425{,}000$$

representing an increase of $75,000 over the value that was projected for the corporation without the acquisition.

In fact, unless S can be purchased at a price such that, in Year 10, S will earn $5.19 per each P share issued, dilution with respect to the growth objective will occur.

The equation that allows the calculation of the maximum P/E ratio that can be paid for company S can be derived as follows:

$$\text{EPSI}(10) = \frac{\text{E2}(10)}{\text{ISH}} \qquad \text{ISH} = \frac{\text{PRICE2}}{\text{P1}}$$

$$\text{E2}(10) = \text{E2}(0) * (1 + \text{g2})^{10}$$

$$EPSI\ (10) = \frac{E2(0) * (1 + g2)^{10}}{\frac{PRICE2}{P1}} = \frac{(1 + g2)^{10} * P1}{\frac{PRICE2}{E2(0)}}$$

$$\frac{PRICE2}{E2(0)} = \frac{P}{E}$$

$$\frac{P}{E} = \frac{(1 + g2)^{10} * P1}{EPSI\ (10)}$$

where:

E2(10)	=	Earnings of Seller 10 years downstream.
ISH	=	Number of shares of Purchaser issued to buy Seller.
EPSI (10)	=	Earnings per share issued of Seller in Year 10, i.e., E2(10)/EPSI(10).
PRICE2	=	Price paid to Seller.
P1	=	Stock price of Purchaser, at time of purchase
E2(0)	=	Earnings of Seller during the accounting period prior to the merger
g2	=	Projected growth rate of earnings for Seller.

$E1(0)$ = Earnings of Purchaser during last accounting period prior to merger.

$NOS1$ = Number of outstanding shares of Purchaser.

$EPS\ 1(0)$ = Earnings per share of Purchaser during the accounting period prior to the acquisition.

$STDIL$ = Short-term dilution in EPS.

Thus far, the question that we have answered is "How can we make sure that what we are paying in current terms today is consistent with what we want to receive in the future?"

Answering this question provides us with the information we need in order to match our investment decision with our corporate objectives.

The amount of initial dilution for accretion in EPS is given by the formula

$$\frac{E1(1) + E2(1)}{NOS1 + ISH} = EPS1(1) * (1 - STDIL)$$

But just like an initial dilution does not tell us much about the long-term potential of recovery, similarly short-term accretion is no guarantee that in the long run earnings will not be diluted with respect to what they might be if no merger had taken place.

After having assumed the immediate impact on EPS of the acquisition being considered, it becomes important to establish what the intermediate and long-term consequences are going to be.

In Chapter X of a book published by the American Management Association[4], we find a formula that allows to evaluate the behavior of EPS over time as a function of certain assumptions on the relative P/Es and growth rate projected for the two companies. The formula is valid for situations where a P/E multiple is known for both companies. We shall first illustrate the usefulness of the formula as it is presented, then proceed to make it more directly applicable to the evaluation on non-publicly traded companies.

The formula provides an answer to the question: How long will it take a company, whose growth rate equals or exceeds that of the acquiring company, to cause EPS 3 to be greater than EPS1? Or alternatively, how long will it take a company with lesser or equal growth prospects to cause EPS3 to be lower than EPS1?

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[4]D. H. Shuckett, H. J. Brown, E. J. Mock, <u>Financing for Growth</u>, American Management Association, 1971, pp. 118.

The formula, whose derivation we shall not cover, is (making use of our own symbolism):

$$\frac{PE1}{PE2} * \left[\frac{(1 + g2)}{(1 + g1)}\right]^n > 1 \qquad (4.1)$$

where n is the number of years, as defined above. If we apply this formula to the example discussed previously, we have

g_1 = 8% PE1 = 18

g_2 = 12% PE2 = 24

$\frac{PE1}{PE2}$	n	$\left[\frac{1 + g2}{1 + g1}\right]^n$	(col. 1 * col. 3) > 1?
.75	1	1.037	No
	2	1.077	No
	3	1.160	No
	4	1.350	Yes

This analysis tells us that EPS3 < EPS1 for the first three operating years and that from the fourth year on accretion will result.

Conversely, let us consider the hypothetical case where the relative values of g and PE are the following:

$g_1 = 8\%$ PE1 = 18

$g_2 = 6\%$ PE2 = 15

$\frac{PE1}{PE2}$	n	$\left[\frac{1 + g2}{1 + g1}\right]^n$	(col. 1 * col. 3) > 1?
1.2	1	.99	Yes
	2	.98	Yes
	3	.96	Yes
	4	.92	Yes
	5	.846	Yes
	6	.717	No

Although the acquisition of a company with somewhat lower growth rate than the acquirer results in a beneficial contribution to earnings per share of the combined entity during the first five years following the merger, in the sixth year dilution ultimately occurs.

For those situations where a P/E ratio is not available for the acquisition candidate, as in the case for a non-publicly held firm, the above formula may be used as a tool to determine the maximum price per share, or for the whole company, which should be paid in order for the acquirer to incur no EPS dilution by a specified year. Rearranging the terms of (4. 1), we obtain the following expression for the maximum price:

$$PRICE2 = PE1 * E2(0) * \left[\frac{(1 + g2)}{(1 + g1)}\right]^n$$

Alternatively, if it cannot be assumed that earnings will grow at annual compounded rates of G1 and G2, each year's estimated growth rate $g1_t$ and $g2_t$ can be introduced into the formula. For any year n we may then express:

$$PRICE2 = \frac{P1 * NOS1 * E2(n)}{E1(n)} = V1 * \frac{E2(n)}{E1(n)}$$

where V1 = present market value of the acquiring firm's equity.

In conclusion, earnings per share is a valuable criteria to use in evaluating an acquisition. However, it is not per se a sound goal for expansion. We have seen that if the new investment on a present value basis earns less than the rate of return of the acquirer's assets, earnings per share may show an immediate improvement, but will ultimately decline, and thereby reduce the value of the firm. The conclusion to be derived from this result is obvious[5]. An acquisition must first show its profitability through a discounted cash flow analysis; then, earnings per share may be examined. Conversely, following the acquisition, earnings per share could drop, but if this drop is accompanied by an overall risk reduction in the predictability of the returns, the investors would not necessarily be worse off. Another reason why EPS is not a valuable overall criteria is that, just as it does not take risk explicitly into account, it says nothing about cash flows (as distinct from accounting income) available from the investment.

B. <u>R.O.I.</u>

One of the most common criteria to judge any investment by is the expected rate of return. It has proven to be, in other capital budgeting decision, one of the best measures of potential profitability and its use in evaluating acquisition is equally valuable.

The rate of return is related to the price/earnings ratio and to the growth rate in earnings expected from the acquisitions according to the following equation

$$\frac{\text{PRICE2}}{\text{E2(0)}} = \sum \left[\frac{1 + g2}{1 + r}\right]^t$$

[5] J. F. Childs, "Profit Goals for Management", <u>Financial Executive</u>, February 1964.

Where PRICE2 is the price of the acquisition, E2(0) are the earnings of the acquistion for the past twelve months, g2 is the expected growth rate in earnings, r is the rate of return, n is the horizon year.

Graphs and tables for different values of n appear in two articles, one by Cunitz[6] and the other by Fray and Ackerman[7]. The latter have developed a computer program which can generate sets of graphs using any desired combination of growth rates over n years. By entering these graphs, one can use the compounded internal growth rate and the firm's required return on investment to determine the P/E ratio. The maximum price is then computed by multiplying the firm's previous year earnings by that ratio.

If the transaction is going to be of a taxable nature, and the acquisition price so determined is far in excess of the book value of the seller, additional charges to income may have to be assumed in terms of goodwill amortization and/or depreciation of assets restated at their fair market value. In this case, these charges should be computed and the earnings figure must be readjusted to reflect the actual earnings in the hand of purchaser.

The price to be paid for the acquisition, as computed above, may also have to be adjusted to take into consideration the present value of any incremental investment or divestment that may be required in the future to achieve the assumed growth target.

[6] J. A. Cunitz, "Valuing Potential Acquisitions", Financial Executive, April 1971, pp.

[7] Op. Cit.

One more adjustment may be necessary to determine the price to be paid for the acquisition if its returns are to be consistent with the objectives of the parent. Specifically, we have in mind the issue of leverage. Adjustments should be made for any change in the level of financial leverage available to the firm after the proposed acquisition. If cash is not a scarce resource and the buyer has no intention of using excess debt capacity, then probably no adjustment is necessary.

So far, we have referred to ROI as the DCF rate of return on investment (i.e., internal rate of return) as may be determined from the present value formulas. In practice, however, ROI is usually calculated in book terms, that is, as the ratio b of net income to average invested capital or net worth during the accounting period. Solomon[8] has shown how b and r differ, and how b is generally a complex function not only of r but also of a firm's depreciation and expensing policies, time configuration of assets' returns, and other items.

The implications of the differences between b and r can be summarized to:

1. For a single company, b cannot be treated as an unbiased estimate of r.

2. When analyzing data from several companies, one cannot directly equate differances in b, with corresponding differences in r.

[8] E. Solomon, "Alternative Rate of Return Concepts and Their Implication for Utility Regulation", The Bell Journal of Economics and Management, Vol. 1, No. 1 (Spring 1970), pp. 65-81.

3. One cannot use as the required rate of return for ex-ante investment analysis the DCF rate of return and then measure ex-post performance in terms of book rate of return.

To avoid any inconsistencies, the actual or prospective performance of an investment is measured in DCF units, and if this rate is being measured against some standard, the relevant standard must itself be computed in DCF units. Therefore, in looking at other companies in an industry to determine the return that investors demand in that industry, if this figure is going to be subsequently used to perform DCF analysis, then one should make sure to focus on the market rate of return k (the cost of capital) not the book value return. Risk adjustements may then be introduced to allow for perceived differences in riskiness between the kind of investment being evaluated and the kind of investment from which the market rate of return has been derived.

In conclusion, ROI and EPS are only two of several criteria that management will make use of in evaluating an acquisition. For instance, the issue of control may at times be just as important, particularly when the size of the seller is not negligible with respect to the size of the buyer. If a cash transaction is envisioned, the purchasing firm may be concerned with meeting minimum working capital needs. These and other goals have to be traded off against one another. In Chapter VIII, we will present a technique that, under certain assumptions, can be of help in structuring a financial package that is consistent with the relative importance that the decision maker assigns to each goal.

C. Diversification

In dealing with risk, that is, with the estimated variability of future returns, we have so far followed one of the propositions of modern capital theory, namely,

> That the risk characteristics of a capital investment opportunity can be evaluated independently of the risk characteristics of the firm's existing assets or other opportunities[9].

In so doing, we assumed that investors are able to achieve the same degree of diversification as the firm is able to achieve for them (case of perfect capital markets).

The assumption of perfect capital markets, and its conclusion that, unless synergistic benefits accrue, conglomerate mergers consumated solely for purposes of diversification do not enhance shareholder's wealth[10], has been challenged by many authors.

In the course of this section, we will assume imperfect markets and furthermore that the company being acquired offers the stockholders of the acquiring company some diversification opportunity not to be otherwise found in the market place. This may be a plausible condition with closely-held corporations. In imperfect markets, investors may not have the same opportunities as a corporation has.
(continued on page 94)

[9] Stewart C. Myers and Gerald A. Pogue, A Mixed Integer Linear Programming Model for Corporate Financial Management, Working Paper Alfred P. Sloan School of Management.

[10] S. C. Myers,"Procedures for Capital Budgeting Under Uncertainty," Industrial Management Review, Spring 1968.

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In this light, a merger represents a potential gain for investors, especially if it is considered that on the average investors hold less than four stocks[11]. It is true, however, that they account for a small fraction of the total stockholdings.

An additional source of gain has been pointed by Levy and Sarnat[12]:

> If we assume that in any given year (or run of years) there exists for each individual firm some positive probability of suffering losses large enough to induce financial failure, ... the joint probability of such an event is reduced by ... the combination of other than perfectly correlated income streams in a conglomerate merger ... The diversification can be expected to create a time economic gain to the shareholders owing to the fact that the combination of the financial resources of the two firms making up the merger reduces lender's risk while combining each of the individual shares of the two companies in investors' portfolios does not.

If the firm does something for the investor that he cannot do for himself, then this action may result in an increase in share prices. Therefore, while theoretically, under perfect market situation, diversification by the firm should not benefit the shareholders, in practice it may well be a legitimate concern of the firm and a positive contribution to the wealth of the shareholders[13].

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[11] J. Lintner, "Expectations, Mergers, and Equilibrium in Purely Competitive Securities Market", American Economic Review, May, 1971.

[12] H. Levy and M. Sarnat, "Diversification Portfolio Analysis and the Measy Case for Conglomerate Mergers", Journal of Finance, September 1970, pp. 801.

[13] J. F. Weston, E. F. Brigham, Managerial Finance, Holt Rinehart and Winston, 1969, pp. 229.

In what follows, the risk of the prospective acquisition will be judged in terms of its marginal contribution to the risk of the firm as a whole. By taking this approach, the price, or alternatively, the cost of financing the acquisition will reflect the diversification effect that its acceptance may have on the risk inherent to the acquirer's returns to equity.

A favorable portfolio effect will result if the returns of the acquisition vary inversely or less than exactly proportionately with those of the acquirer. This would tend to make the overall returns to the firm more stable over time, and therefore, less risky.

The degree of proportionality in the variations of returns between two firms is at the basis of the statistical concept of correlation. When the variations of returns of two firms tend to vary in the same direction, there is said to exist positive correlation; if the variations tend to vary in opposite directions, there exists negative correlation; if no covariance can be established for the variations, the estimated returns for the two firms are said to be uncorrelated.

As related to the resulting portfolio effect that the consolidation of two firms may have, uncorrelation is not as useful for reducing overall risk as is negative correlation, but it is better than positive correlation.

The returns of investments which are closely related to the firm's basic products and markets will generally be highly correlated to the returns of the existing assets and, therefore, will not reduce the overall firm's risk. However, investments in other markets or different product lines may present a lower degree of correlation with the acquirer and thereby provide overall risk reduction to the firm. Diversification through acquisition usually can be accomplished more quickly and perhaps more efficiently[14] than through internal growth alone.

In what follows, we shall illustrate methods through which management can evaluate investment proposals, taking the point of view of improving the total business-risk complexion of the firm.

The conceptual basis for these methods was developed by Markowitz in 1952 and applied to stock portfolio selection[15]. Therefore, some of the probability concepts to be employed come from security portfolio analysis. Two key relationships are the equations for portfolio return and standard deviation.

i. Portfolio Standard Deviation

The total variance of a combination of risky investments depends (i) upon the risk of each individual investment and (ii) upon the degree of correlation between investments.

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[14] Van Horne, op. cit, pp. 180.

[15] H. Markowitz, "Portfolio Selection", Journal of Finance, March 1952, pp. 79-91.

In the two asset case, the standard deviation on the returns of the portfolio can be expressed as:

$$\sigma_p = \sqrt{x^2 \sigma_1^2 + (1 - x)^2 \sigma_2^2 + 2x(1 - x) \rho \sigma_1 \sigma_2} \qquad (4.2)$$

where x is the proportion of the total funds invested in Investment 1 and (1 - x) is the proportion of funds invested in 2. ρ is the coefficient of correlation between the two investments.

From the formula above, it appears that, on account of the coefficient of correlation, an investment which when considered in isolation may have the lowest risk, may in fact not provide the lowest total variance on the returns to the firm when it is included as part of its existing assets.

ii. Portfolio Rate of Return

The expected rate of return on a portfolio is the weighted average of the expected rates of return of the individual investments. In the two assets case:

$$r_p = x r_1 + (1 - x) r_2 \qquad (4.3)$$

iii. Evaluating the Acquisition

In taking the portfolio approach, one would compute the expected return of the acquisition and its standard deviation, and using Equations (4.2) and (4.3) compute the r_p and the σ_p of the portfolio that includes the acquisition as part of the firm. For various acquisitions that are being evaluated, one can thus select the one that has the most favorable combination of return and risk for the firm as a whole. In Appendix D, we have described how, in the case of isolated investments, it is possible to eliminate the need for subjectively determining the desirability of risk-return combinations of one investment versus another. Tuttle and Litzenberger[16] have extended their "risk-equivalence" method to the portfolio approach. The assumption made is that management wishes to maintain the degree of risk inherent to the returns to equity prior to the acquisition.

This may be done by trading off financial risk for operating risk. On the assumption that the amount borrowed or lent is considered as part of the price to be paid for the acquisition we may determine what fraction β of the total package should consist of equity, so as to keep the financial risk to the equity after the acquisition equal to before. If $\beta < 1$, $1 - \beta$ will represent the amount of debt the acquirer has to issue as part of the payment; if $\beta > 1$, $\beta - 1$ represents the amount of lending that must accompany the package.

[16]Tuttle and Litzenberger, op. cit., pp. 435 ff.

Let:

$\sigma_1^*(t)$ = estimated standard deviation (or error of return) on the acquirer's equity at time t (t = 0 prior to the acquisition; t = 1 after the acquisition).

σ_2^* = estimated standard deviation of return on the total equity of the acquired firm after the acquisition.

σ_2 = estimated standard deviation of the acquisition candidate's ROA (μ_2).

V_1 = the market value of the firm's equity, pre-acquisition

PRICE2 = price to be paid for the acquisition

ω_o = proportion of total equity funds to be invested in the acquisition (CSI/V1 + CSI).

$(1 - \omega_o)$ = proportion of total equity funds invested in the original firm.

ρ = coefficient of correlation of the returns from the acquisition with the returns on the firm's existing assets.

Then the σ_p^* can be expressed as

$$\sigma_p^* = \sqrt{\omega_o^2 (\sigma_2^*)^2 + (1 - \omega_o)^2 (\sigma_1^*)^2 + 2\rho \ \omega_o(1 - \omega_o) \sigma_2^* \sigma_1^*} \quad (4.4)$$

Since by definition

$$\omega_o = \frac{\beta * \text{PRICE2}}{\text{V1} + \beta * \text{PRICE2}}$$

and

$$\sigma_2^* = \frac{E_2 + D_2}{E_2} \sigma_2 = \frac{1}{\beta} \sigma_2$$

we may rewrite (1) in terms of β as:

$$\sigma_1^*(1) = \sqrt{\left(\frac{\text{PRICE2}}{\text{V1} + \beta * \text{PRICE2}}\right)^2 \sigma_2^2 + \left(\frac{\text{V1}}{\text{V1} + \beta * \text{PRICE2}}\right)^2 \sigma_1^*(0)^2 + 2\rho \frac{\text{PRICE2} * \text{V1} * \sigma_1^*(0)\, \sigma_2}{(\text{V1} + \beta * \text{PRICE2})}} \qquad (4.5)$$

Since we want to determine the value of β such that the risk to the acquirer's equity may remain constant, i.e.,

$$\sigma_1^*(1) = \sigma_1^*(0) \qquad (4.6)$$

we equate the two expressions and obtain the following quadratic equation in β:

$$(\mathrm{PRICE2} * \sigma_1^*(0))^2 \beta^2 + 2(\mathrm{V1} * \mathrm{PRICE2} * \sigma_1^*(0))^2 \beta$$

$$- \mathrm{PRICE2} * \sigma_2 (\mathrm{PRICE} * \sigma_2 + 2\rho \ \mathrm{V1} * \sigma_1^*(0)) = 0 \quad (4.7)$$

Once this equation is solved, the cost of financing the acquisition is simply:

$$k = \beta * \mu_2 + (1 - \beta)i$$

where μ_2 represents the expected return on equity of the acquisition, and i, the riskless interest rate. This is the risk-equivalent cost of capital as used in Appendix C and β and $(1-\beta)$, as computed by solving Equation (4.7), are the appropriate weights to be used in financing the investment, if μ_2 is to remain unchanged. The acceptance of the acquisition candidate can then be determined by discounting its expected cash flows by the cost of financing k and applying the net present value (NPV) criterion to the discounted stream of net cash flows. In equilibrium, the aggregated increase in the market value of the firm's previously outstanding common equity would equal the acquisition's NPV when discounted by its cost of financing. Such is the case here since under the hypothesized market conditions the estimated standard error of return to equity and, hence, the equity capitalization rate, will remain unchanged.

It is often the case that the mix of funds to be used to pay for the acquisition is known. In such cases, Equation (4.7) can be solved for PRICE2, the price to be paid for the acquisition given that the acquirer wishes to preserve the amount of risk inherent to the equity prior to the acquisition.

In practice, when several prospective acquisitions are being evaluated, one must first describe each acquisition in terms of its μ and σ. Then one must compute the μ_p and σ_p given that each acquisition is now part of the acquiring firm. The resulting μ_p and σ_p of the several portfolios may then be plotted on a scatter diagram, as depicted below.

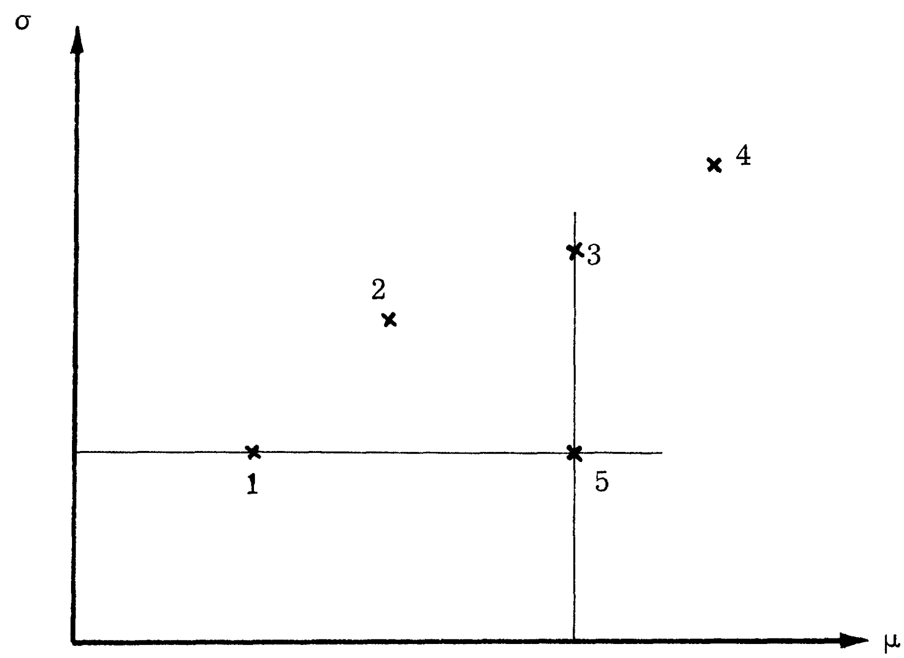

Figure 4-1

Collectively, the points represent the total set of investment opportunities available to the firm. Certain dots dominate others in the sense that they display a higher r_p for the name σ_p (dots 5, 1) or a lower σ_p and the same r_p (5, 3) or both a higher r_p and lower σ_p (5, 2). Therefore, 4 and 5 dominate all others, but it is not possible simply by inspection to decide which of the two projects is more desirable. Using the Tuttle-Litzenberger technique, we make the internal rate of return on those two projects risk-equivalent to the firm's equity of borrowing or lending. We then select that acquisition which produces the highest return.

We conclude the section by restating the fact that the acquisition of a privately owned company with a low degree of correlation with the existing operations of the acquirer provides a firm with the possibility to reduce its overall business risk complexion, and hence, increase the market value of its equity. Though this concept is theoretically quite powerful, we realize that in practice the quantitative analysis may be rather difficult to perform.

CHAPTER V

Forms of Payment

One of the many financial issues to be addressed in the analysis of an acquistion candidate concerns the exchange terms and media to be employed in the transaction. Specifically, it is necessary to determine the form of the transaction and the type and amounts of securities to be exchanged, which will most satisfy the diverse interests of the buying and selling stockholders. In the present chapter, we will first briefly discuss the various forms of transaction along with some of the advantages and disadvantages of each. We will then explore the implications that taxes may have on the price that the buyer is willing to pay for the firm, depending on the form of payment. Finally, we will concentrate on one particular type of merger financing tool, the contingent payment contract, because it has proven particularly attractive in the acquisition of closely held corporations. In consideration of the differences that may separate the buyer from the seller with respect to the value of the firm, this type of contract will be introduced as a logical way to bridge these differences and reduce the perception of risk involved in the acquisition.

A. Type of Transaction: Purchase and Reorganization

There are various possible methods that may be used in acquiring a business and each has different attractiveness to the seller and to the buyer. The various media of payment that can be used in isolation or in combination include: cash, bonds, preferred stock, common stock, warrants or convertibles.

There are two basic types of transactions that are used to combine business entities: purchase and reorganization. The accounting treatment of these transactions is particularly relevant to the tax aspects of a merger. A tax-free transaction, a reorganization, usually makes use of pooling of interest accounting, whereas a taxable transaction, a purchase usually implies purchase accounting.

Under a pooling of interest, all assets of the newly combined group are valued at the same amount at which they were previously carried in the accounts of the individual firms. Under the purchase method, the buying company is permitted to write-up the value of the acquired assets to reflect the purchase price. The excess of the purchase price over the assets acquired is called goodwill. Goodwill is recorded as an asset and amortized over a number of years not to exceed 40, as specified in the Accounting Principles Board, Opinion 17. This amortization cannot be expensed for tax purposes but is nevertheless charged against income and, therefore, has a negative effect on earnings per share, without providing a compensating benefit through tax shelter.

Let us now consider the various forms of purchase and reorganization, along with some of the advantages and disadvantages of each.

1. Purchase

This type of transaction is usually treated as taxable. The shareholders of the selling company are subject to immediate payment of capital gains tax based on the difference between the acquisition price and their original cost basis. The more relevant forms of purchase are:

i. Purchase of Assets

In a purchase of assets, the seller may be double-taxed both at the corporate and the personal level unless (i) the seller adopts a plan for liquidation under Section 336 which avoids taxation at the corporate level, or (ii) a corporation is formed to buy at least 80 percent of the stock, which is then liquidated within two years.

Another problem is the allocation of the purchase price to the various assets[1].

From the buyer's point of view, tax-loss carry-overs cannot be bought as an asset. Also, it may be difficult to obtain certain leases or franchises.

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[1] Allen D. Choka, Buying, Selling and Merging Businesses, Business Associations/Practice Handbook, 1965.

ii. Purchase of Stock

The most common problem to the buyer is that of unforeseen liabilities; the buyer can partially hedge by using an escrowagreement. Also, assets cannot be written up, unless liquidation is used.

iii. Installment Purchase

The tax-law allows profits from the sale of property to be reported in the years in which payments are received, both for purchase of assets or purchase of stock, provided that the payment received during the year of sale is not in excess of 30 percent of the total selling price.

This method may be of interest in buying a closely held corporation, because the owners can either save taxes, depending on their tax bracket, or can defray taxes to future years, when each additional payment is received.

2. Reorganization

This type of transaction usually qualifies for tax-free treatment: the shareholders of the selling company are thereby allowed to defer payment of capital gains tax on the newly received shares until the time these shares are sold.

The more relevant forms of non-taxable transactions are:

i. Type A

This includes the consolidation, whereby two corporations are fused into a new third entity, and the statutory merger, whereby one company becomes part of another which is the surviving one.

These are the only forms of reorganization in which the stock issued does not have to be voting stock. In fact, cash or debt may be used as part of the payment, if the seller pays ordinary taxes on it, and if the stock portion is at least 50 percent of the total exchange package.

ii. Type B: Stock for Stock

Only voting stock is exchanged for at least 80 percent of each class of voting stock of the acquired corporation. This method is particularly popular when a listed company is buying a closely held corporation, because it affords the seller liquidity and flexibility.

The disadvantage to the buyer, a part from dilution problems, is that tax-loss carry-overs cannot be used in as much as the corporate entity of the acquired company remains alive. This tax-loss carry-over can be used only if the company turns profitable or a subsequent reorganization to a new A or C type occurs.

iii. Type C: Stock for Assets

Only voting stock is exchanged for substantially all the assets of the acquired corporation, where "substantially all" test is believed to be about 80 percent of the market value of the assets.

This technique is often selected in order to avoid acquiring certain assets or assuming certain known or any unknown liabilities.

For a more complete treatment of this subject, a valuable reference is: Schuckett, Brown, Mock "Financing for Growth", American Management Association, 1971, Chapter 16.

B. Tax Implications in Merger Negotiations

Taxes may largely determine the preferences for a particular type and form of payment. For instance, buyers may be interested in taking advantage of tax-loss carry-forward of firms who have had considerable losses in most recent years of operation. The buyer can only take advantage of these losses if it owns at least 80 percent of the acquired firm's voting stock. A seller, on the other hand, may be interested in deferring his tax consequences, in minimizing estate taxes, or in avoiding double taxation. If no tax considerations were involved, whether the transaction is ultimately going to be accounted for as a purchase or as a pooling of interest would not affect the valuation of the acquisition. When taxes are taken into consideration, the accounting mode of acquisition can no longer be overlooked.

Generally speaking, an acquisition, when treated as a purchase, allows the buying company to amortize depreciable facilities and thereby provides a tax shelter that depends on the extent of the assets write-up. The greater the differential between the acquisition price and the book value of the acquired company, the greater the benefit to the buyer. Because a stock acquisition does not provide this advantage, the buyer is usually willing to pay a higher price for a cash transaction than for a stock transaction.

To the seller exactly the opposite is true: usually a stock transaction is preferable, due to the opportunity it provides to defer payment of capital gains tax. Therefore, the analysis of the tax consequences of the acquisition centers around the issue of whether the incremental benefit to the buyer provided by the stepped-up basis is large enough to allow compensating the seller for the additional tax costs that he would incur, and yet still provide a residual benefit to the buyer. Schwartz[2] illustrates this point through the following example:

	Tax-Free	Taxable	Taxable
Sales Price	30	34	31.3
Estimated Cost Basis	22	22	22
Capital Gains	8	12	9.3
Capital Gains Tax, 25%	2 (paid in 10th year)	3 (paid now)	2.3 (paid now)
Present Worth of Tax at 8%	1	3	2.3
Net Realization:	7	9	7.0
Sales Price Less Present Worth of Capital Gains Tax	29	31	29

The price to be paid for the acquisition, subject to a tax-free transaction, is assumed to be \$30,000,000 and the same price on a taxable basis is assumed to be \$34,000,000, reflecting a present worth of \$4,000,000 for the difference in tax basis to the buyer. Working through

[2]S. Schwartz, Merger Analysis as a Capital Budgeting Problem. The Corporate Merger, W. W. Alberto and J. E. Segall, Univ. of Chicago Press, 1966.

the tax implications to the seller, the latter turns out to be better off by $2,000,000 under a taxable transaction. If the seller, however, were paid $31,300,000, he would be as well of in a taxable acquisition as in a tax-free one. Therefore, a settlement in the price range between $31,300,000 and $34,000,000 for a taxable merger is beneficial to both the buyer and the seller.

In a following chapter, we will be discussing a technique that allows the buyer to evaluate different ways of structuring a merger package so as to best satisfy his company's internal goals. Many of the constraints that the buying company must satisfy come, however, from the need to cater to external goals, those of the seller. Some sellers are looking for a good cash flow in the years following the sale. Others want nothing but capital gains. Some need cash to start a new venture, others cannot bear the thought of paying taxes. Some are looking for a continuation of their involvement in the management of the firm, others are looking for ways to pass on the largest possible share of their wealth to their heirs.

Both parties are subject to a mixture of influences which are both personal and corporate, private and public. Structuring the appropriate deal is oftentimes a creative step and imagination may well be an essential prerequisite to closing a deal, particularly when the seller is a privately-held concern.

C. The Contingent Contract

The difficulty inherent in the valuation process, differences in goals and expectations, the limitations of the techniques available to deal with the uncertainties involved, undoubtedly all contribute to the gap in expectations that usually separates the buyers from the sellers with respect to the price to be paid for an acquisition.

Expectations can be particularly divergent when the selling company does not possess a complete history of operations, or has only been in existence a short while, or where there is considerable doubt about its ability to perform after the acquisition. This is especially true for closely-held corporations, when records may be incomplete or unaudited, or where the seller may feel that he has made no attempt to get the best out of the firm. In fact, he may contend that he has tried harder to keep the earnings low, rather than maximize them. As a result, the seller may feel that current and past reports understate the true potential of his firm. The question is then, what if anything can be done to narrow the gap between the buyer and seller. When the seller is willing to continue managing the firm, the use of contingent payment contracts (also referred to as earn-outs, buy-out plans, contingent payouts) has been suggested[3] as a logical way to reconcile, from a business point of view, positions that look otherwise quite far apart.

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[3] C. Hecht, "Earnouts", Mergers and Acquisitions, Summer 1967.

A contingent payment plan implies that the price paid for the firm, will be determined in part at least by the performance of the acquired firm after the acquisition.

The down payment by the buyer can be made in any of the forms discussed in the previous section. The lower the down payment, the greater the upside leverage and the downside protection to the buyer, the greater the risk to the seller. The buyer also agrees to additional payments if the seller meets or exceeds predetermined performance standards during a certain number of years following the acquisition. Contingencies can be based on sales, net worth, market values, cash flows, return on operating assets as well as earnings which is the most common criterion. The only real limitation to the selection of the criterion is that it be measurable.

1. Contract Types

Various formulas have been developed to link the payment scheme to the performance criteria. The most commonly used contract is the "set standard"[4] of the "base-period earn-out". Contingent payments are made during each year in proportion to the amount of increase in earnings in excess of the base year's earnings. The seller receives either a cash payment at some multiple of those excess earnings, or if stock is the medium of transaction a number of shares equal to:

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[4]W. Reum and T. Steel, "Contingent Payouts Cut Acquisition Risks", Harvard Business Review, March-April, 1970.

$$\frac{\text{excess earnings * capitalization rate}}{\text{market price}}$$

Where the denominator represents the market price of the shares of the buyer's common stock and the capitalization rate, subject to negotiation, is the multiplier (a number) that is applied to the excess earnings.

A second type is the "moving standard" of the "increment earn-out ". This method emphasizes continuous growth and prevents the seller from fluctuating earnings in order to increase the payment. The standard is the previous year's earnings, but normally the agreement will also state that the highest earnings in any of the previous earn-out years must be used. This way the seller is not allowed to take advantage of a bad year, which would tend to make the following year's improvement look artificially high. The expression that can be used is similar to the base year formula:

$$\frac{\text{yearly increase in earnings x capitalization rate}}{\text{market price}}$$

The "cumulative earn-out" focuses on cumulative earnings performance. Current earnings are multiplied by the number of years in the contract period and this is used as a standard against which to compare the earnings at the end of the contract period. This method focuses on the whole period and no shares, unless otherwise agreed, will be received by the seller till the end of the period.

Finally, the "reverse earn-out" essentially reduces the purchase price, which is originally paid in full, if performance is not met.

Whatever the contract type, the buyer and seller have to negotiate an appropriate standard and the reward function. The buyer usually sets a maximum on the number of shares to be paid out in any one period to prevent excessive dilution of earnings.

Accounting procedures for contingent contracts are discussed in detail by S. P. Gunther[5].

2. Advantages and Disadvantages

The major conceptual advantage of using this type of merger financing is that it offers the possibility of reconciling positions with respect to the valuation of the firm, that might otherwise be totally opposite. In fact, it removes many of the pressures of dealing with the uncertainties involved in setting a fair market price, by allowing the final price to be determined on the basis of performance. For the seller, it provides a chance to prove the real worth of his business and fully capitalize on it.

Other advantages to the buyer include:

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[5] S. P. Gunther, "Contingent Payouts in Mergers and Acquisitions," The Journal of Accountancy, June 1968.

1. Provides incentive to the seller's management team to stay and increase the earnings of the company.

2. Reduces risk, since the buyer pays for proven performance.

3. Effectively the buyer is borrowing money from the seller to finance the acquisition.

4. Reduces the impact of dilution, although opinion 15 of the Accounting Principles Board now requires that earnings per share be reported on a fully diluted basis.

One of the major disadvantages is that the contract must be negotiated in every detail. This includes defining earnings and accounting practices in general. There are many ways in which earnings may be manipulated[6] and care must be used to avoid problems connected with depreciation, capital budgeting, discretionary expenditures and management salaries. Other disadvantages include:

1. Buyer is not free to reorganize; the acquired business must continue to operate as an autonomous subsidiary.

2. Seller suffers a delay in receiving his full payment and thereby bears a share of the risk.

3. The contract must be administered during the contingent period.

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[6] "What Are Earnings? The Growing Credibility Gap", Forbes, May 15, 1967.

4. The seller may be tempted to sacrifice long-term profits for short-term gains.

CHAPTER VI

Acquisition Analysis: A Procedural Framework

Thus far, we have described several concepts and methods which may be of use to the valuation of a closely-held firm. Some techniques were presented because of their widespread use in the field or because they were found applicable to perform a specific calculation; others, because they provided useful conceptual guidelines to the valuation process.

In this chapter, we propose a framework of analysis that draws on a subset of these techniques and which suggests a practical proceduure for performing the valuation analysis of a prospective acquisition. Because all the concepts which are used in this chapter have already been presented in previous ones, we shall assume the reader is reasonably familiar with them, and shall, therefore, not indulge in further elucidations. Furthermore, for purposes of clarity, we have deemed it advantageous to present the proposed framework by means of flowcharts rather than through a verbal description. We suggest the reader keep referring to Macro-Flowchart 1 as we describe the main conceptual flow.

The basic characteristic of the framework is that it is intended to be used iteratively and not in a "one pass" mode. That is, the acquirer should start going through its procedural steps as soon as he has enough data to work through each step. He thereby obtains an initial rough estimate of the price range to be paid for the acquisition. Subsequently, as he acquires more information and refines his estimates, it will be necessary to rerun the analysis to obtain sharpened figures and to define more precisely the range of possible negotiating prices. Furthermore, at any point in the analysis, the same interative process will be required to provide answers to any "what if" type questions the acquirer may wish to ask.

The analysis begins with the determination of the fair market value of the firm to be acquired. For this purpose, we employ the three valuation methods described in Chapter II: the asset, market (Flowchart 2) and DCF (Flowchart 3) valuation methods. This analysis determines a range of possible values, lower bounded by the liquidation value of the firm.

The next step in the analysis is to establish the value that the acquisition has to the buyer (Flowchart 4). This is done by evaluating the incremental benefits expected to accrue because of the consolidation as suggested by the analysis. covered in Chapter III, Section B. The present value of these benefits is added to the fair market value to obtain the value of the firm before adjustments.

Two types of adjustments are then performed to determine the maximum price to be offered for the acquisition; the first, takes into consideration the tax benefits which may result from the type of transaction used (we discuss these in Chapter V, Section B); the second computes the price constraints set by various performance criteria as discussed in Chapter IV (Flowchart 5).

At this point of the analysis, FUSION (as described in Chapter IX) becomes a useful tool to evaluate, vis-a-vis specified performance criteria, the tax advantages which may be derived by issuing different exchange packages. This is done by first examining the tax benefits which may derive from the use of different types of exchange media, and then, by using FUSION to examine, for each different case, how close the viable packages come to satisfying the set of performance criteria. The result of this analysis not only determines the most attractive package to be issued, but also bounds the maximum price to be offered for the selling firm. We denote this price as the maximum price after adjustments and taxes (MAXPTA).

At this point in time, the analysis focuses on the seller's expectations. The type of transaction used has an impact on the amount of money the seller will ultimately obtain, after taxes. The seller will therefore adjust his demands according to whether the deal is going to be tax-free or taxable. In the case of a tax-free transaction, the net dollar amount in the hands of the seller, assuming he decides to sell the stock in year n, will be:

$$\text{NET PRICE} = \text{PRICE2} - (\text{PRICE2} - \text{COST}) \frac{\text{CGT}}{(1 + k)^n}$$

where PRICE2 is the final negotiated price, COST is the taxable cost basis for the seller, and CGT is the capital gains tax rate. The second term on the right-hand side of the equation represents the present value of the capital gains taxes paid in year n.

In the case of a taxable transaction (the seller pays capital gains taxes immediately after sale), the net dollar amount in the hands of the seller will be:

$$\text{NET PRICE}' = \text{PRICE2} - (\text{PRICE2} - \text{COST})\,\text{CGT}$$

To the extent that,

$$\text{NET PRICE}' < \text{NET PRICE}$$

the price which would have to be offered to the seller in a taxable transaction, and which would yield an after-tax value equal to NET PRICE is:

$$\text{PRICE2}' = \frac{1}{1 - \text{CGT}}\left[\text{PRICE2} - \frac{(\text{PRICE2} - \text{COST})\text{CGT}}{(1+k)^n} - \text{COST} * \text{CGT}\right]$$

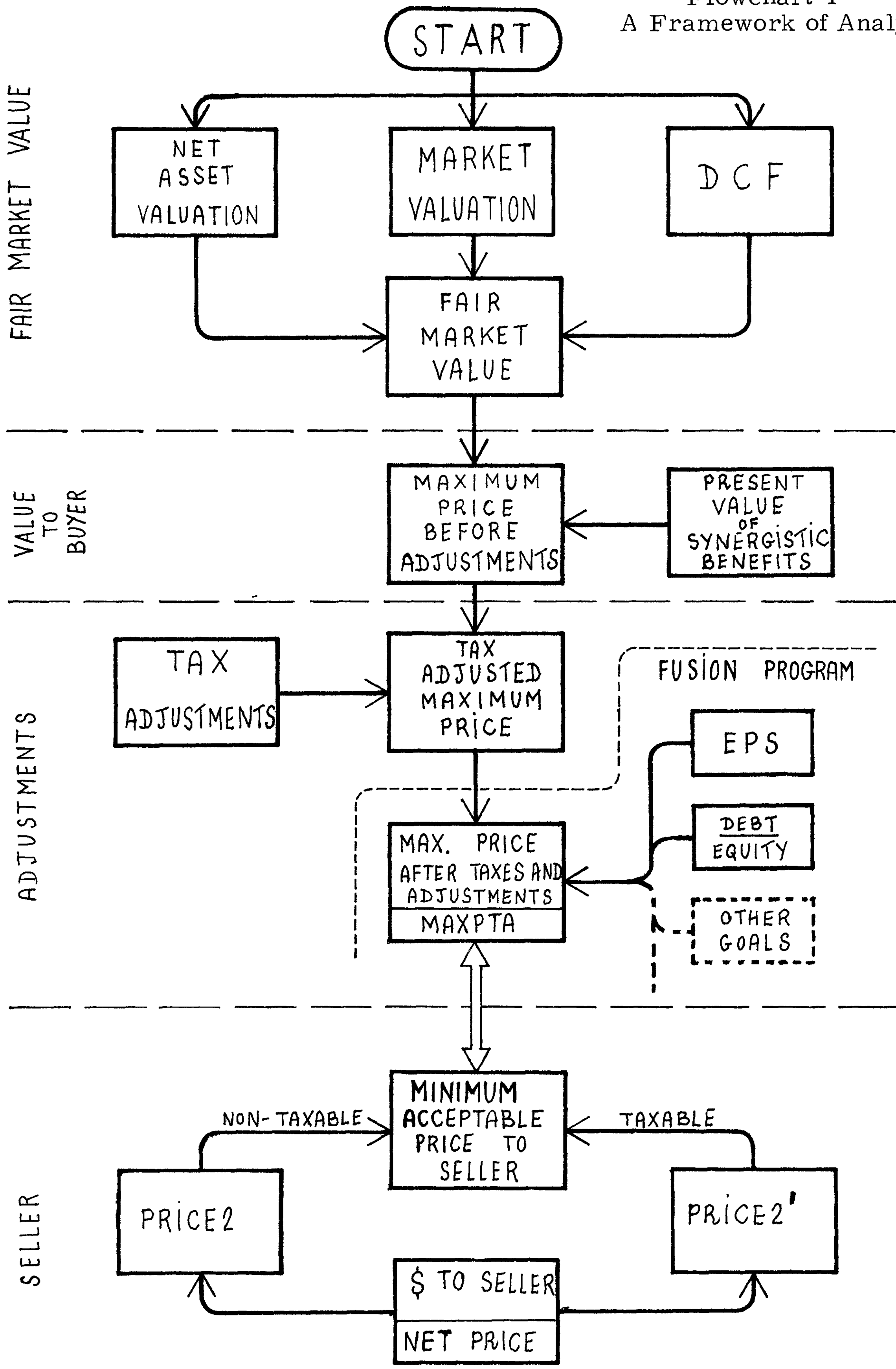
The negotiating sessions usually begin with the buyer willing to offer at most his initial estimate of the maximum price after adjustments and taxes (MAXPTA), and the seller demanding at least PRICE2 in a non-taxable transaction, or PRICE2' in a taxable one. The series of negotiation rounds which normally take place provide the acquirer with the necessary information to reiterate through the proposed procedural framework and obtain updated values for MAXPTA. If we let MINBT denote PRICE2 or PRICE2', whichever applies, the following three cases may finally apply:

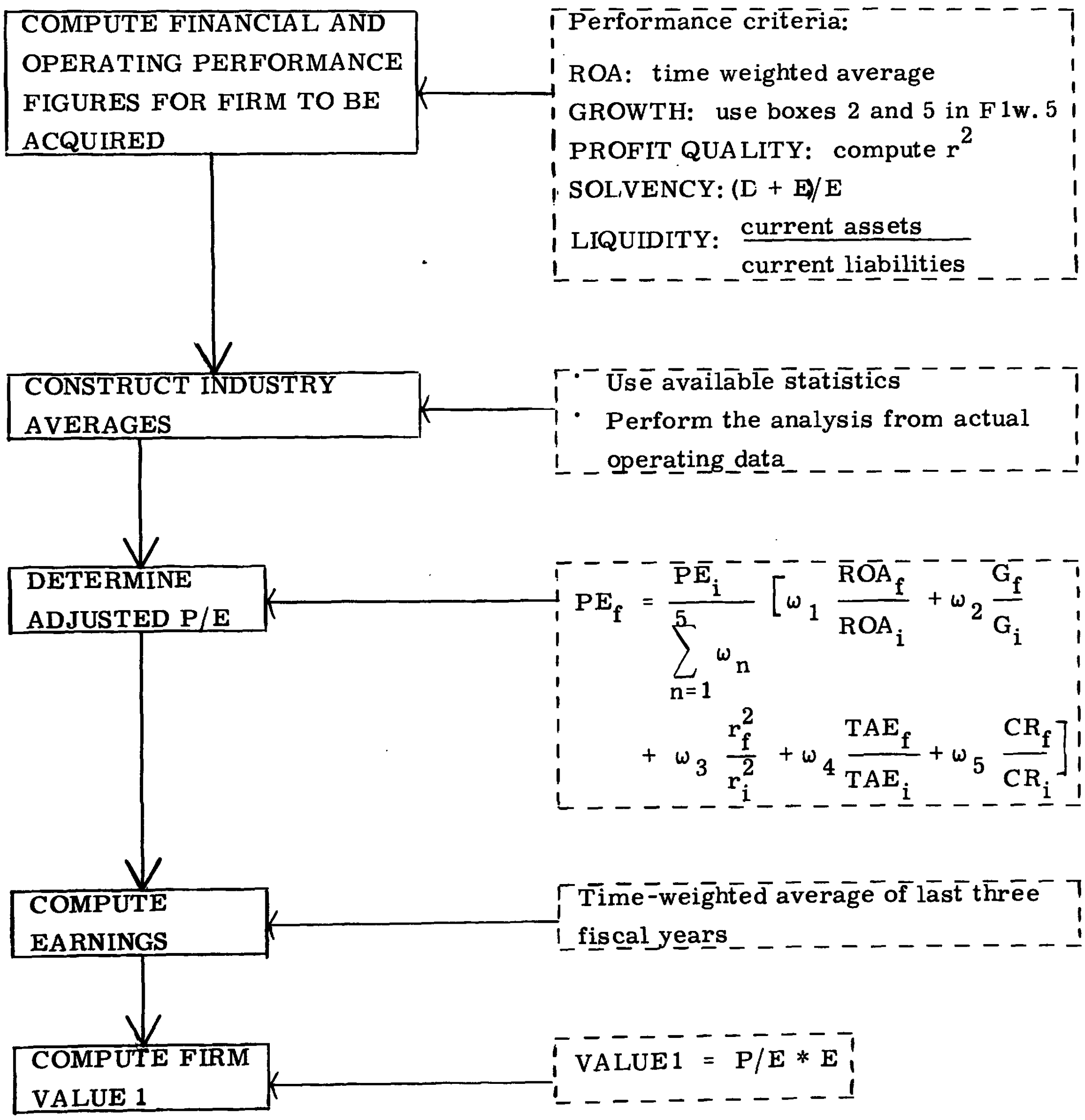
i. MAXPTA = MINBT, the deal goes through and the negotiated PRICE = MAXPTA = MINBT.

ii. MAXPTA > MINBT, the deal goes through and the negotiated price will be somewhere in between those two values. Exactly where it settles, depends on the negotiating power of each party.

iii. MAXPTA < MINBT, either no deal, or it may be feasible to work out a contingent payment contract as described in Chapter V, Section C.

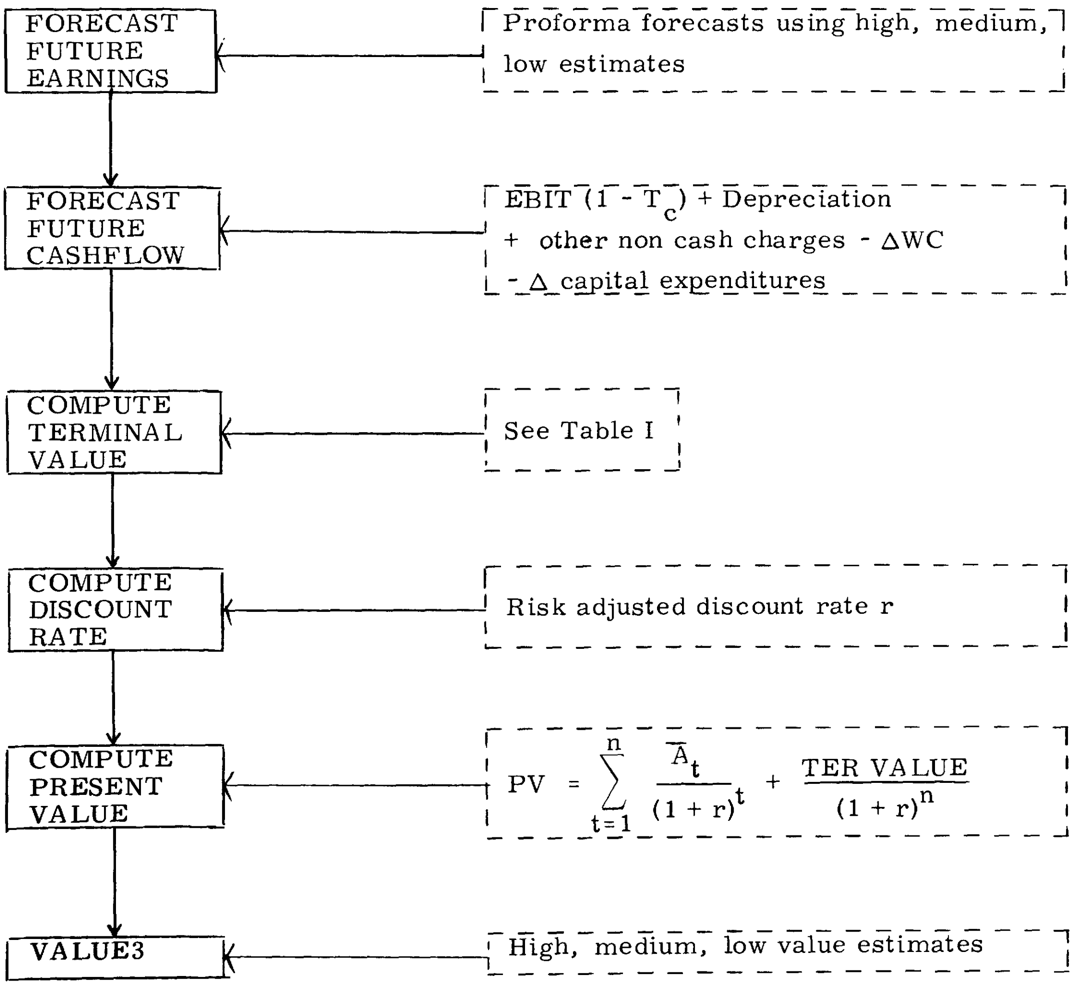
Flowchart 1
A Framework of Analysis





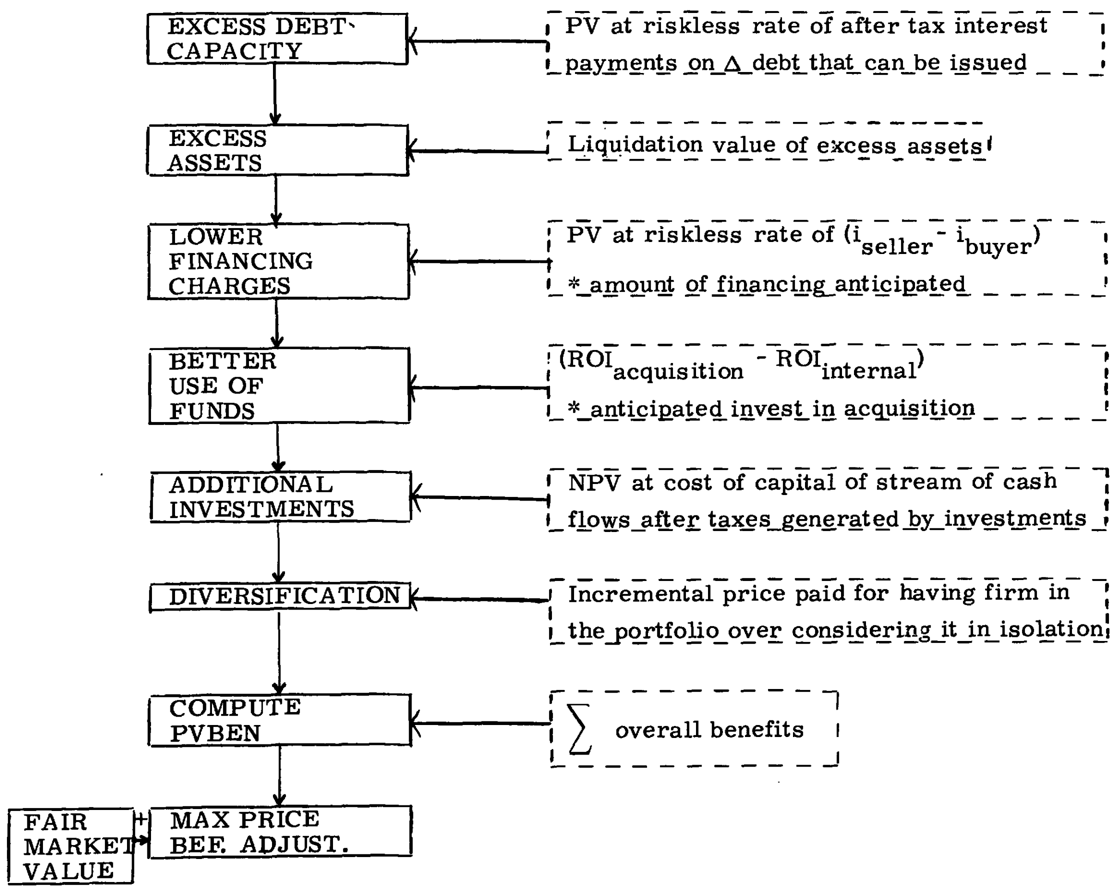
Flowchart 2

Market Valuation: Adjusted P/E Method



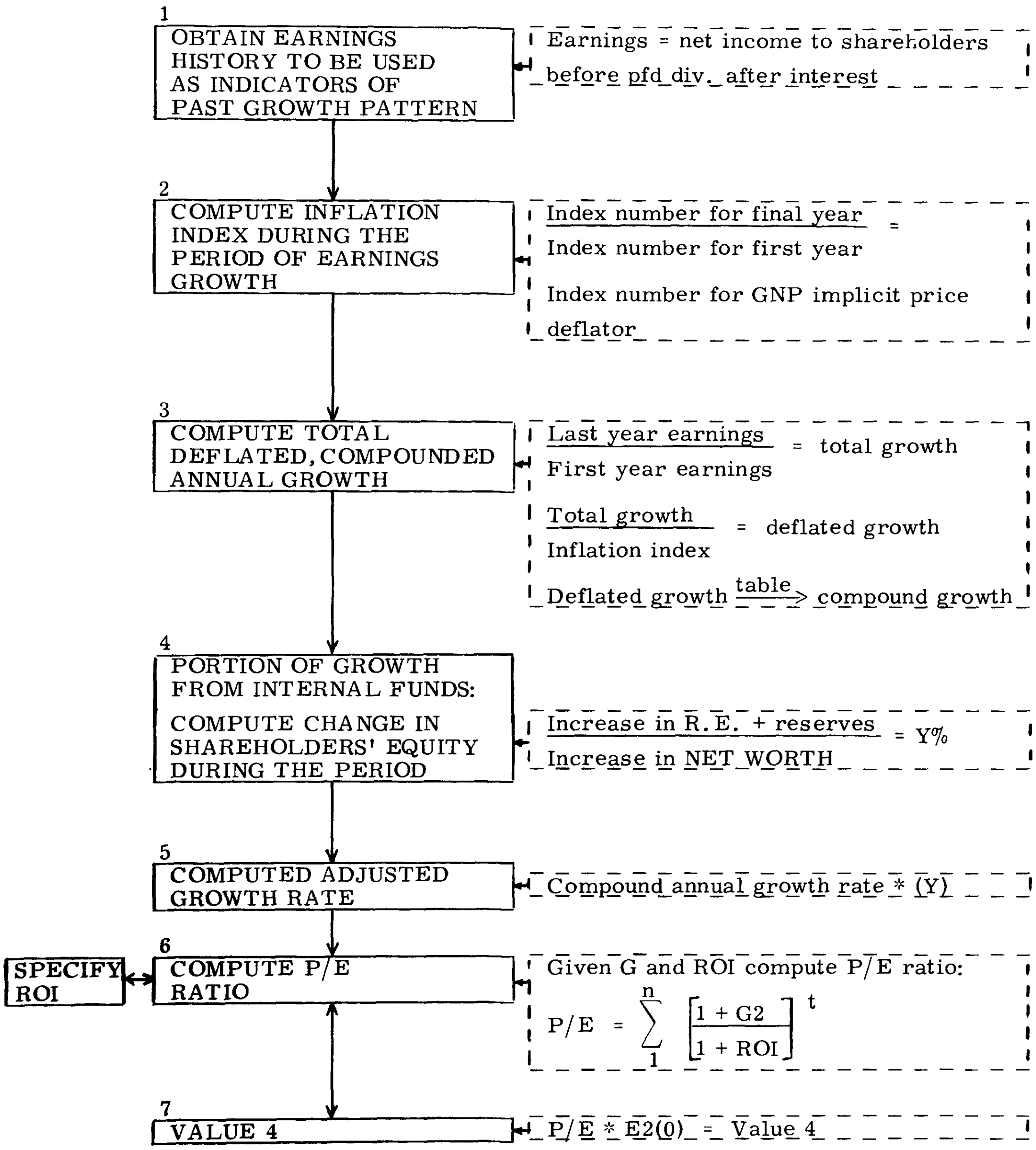
Flowchart 3

Market Valuation: Discounted Cashflow



Flowchart 4

Value to Buyer: PV of Benefits



Flowchart 5

Market Valuation: ROI Approach

CHAPTER VII

Structuring the Merger Package

In Chapter V, we have argued how it is necessary to determine the purchase price and the types and amounts of securities to be exchanged, which will most effectively satisfy the diverse interests of the buying and selling stockholders. This requires that the pricing and packaging analysis be performed in the light of both its impact on the parent and candidate stockholders and on the corporation's capital structure and long-range plans.

In general, the acquisition staff performing such analysis has only a vague idea of what price and exchange package would be attractive to both organizations. Hence, several combinations need to be explored before a recommendation is made to top management. This trial and error way of proceeding, whether performed with the aid of a computer or not, can turn out to be quite lengthy and expensive. To partly shorten and facilities this task, we have used goal programming as a technique for specifying the price and package to be used. Before proceeding to formulate how goal programming may be applied to package structuring analysis, it will be useful to point out what the potential applications and limitations of our implementation are.

On the applications side, the technique may be used to:

a. Determine in a "one shot" fashion (i.e., no trails are performed) the price to be paid and the mix of securities in the package which most clearly satisfy the following management goals:

i. Issue a package of value as close to a prespecified price.

ii. Incur EPS dilution not exceeding a specified percentage.

iii. Preserve a specified degree of control over the combined entity.

iv. Maintain a determined capital structure.

v. Continue to pay a given dollar amount of dividends on all shares outstanding.

vi. Have EPS reach a specified target by a given year-end.

b. Determine the price to offer given that management wishes to meet the aforementioned goals (ii) through (vi) as closely as possible.

The shortcomings of our formulation include the following:

a. The price of the acquirer's shares is exogenous to the formulation, and therefore, unaffected by the amount and types of securities issued.

b. The price to be paid for the acquisition is independent from the types of securities used in the transaction package.

c. The size of the prospective acquisition has to be small relative to the acquirer.

Let us now briefly dwell with the nature of goal programming.

A. The Nature of Goal Programming

Developed and extended by A. Charnes, W. W. Cooper and Yuji Ijiri[1], goal programming is a special type of linear programming, which distinguishes itself in the manner goals (i. e., management desires) and constraints (i. e., environmental conditions under which management makes its decisions) are treated. In ordinary linear programming, only one goal is incorporated into the objective function to be maximized or minimized. If management has multiple goals, then the goals not incorporated into the objective function are treated as constraints of the problem. The computational technique then picks from the set of all solutions that satisfy the constraints the one (or ones) that maximizes or minimizes the objective function. Because management is striving for the highest value of the objective function, it can be viewed as adopting an optimizing behavior. In goal programming, all goals, whether one or many, whether compatible or conflicting, are incorporated into the objective function, and only the true environmental conditions are treated as constraints. Each goal can be set at a value judged

[1]The basic references on goal programming are the following: A. Charnes and W. W. Cooper, Management Models and Industrial Applications of Linear Programming (New York, John Wiley and Sons, Inc. 1961) pp. 219 ff; and Y. Ijiri, Management Goal and Accounting for Control (Amsterdam: North-Holland Publishing Co., 1965)

satisfactory by management, and not necessarily representing the best attainable value. Furthermore, management may rank its various goals so as to obtain a solution which respects its scale of priorities. The computational procedure then picks from the set of all solutions which satisfy the constraints the one (or ones) that attains or comes closest to fulfilling management's specified targets.

These differences between goal and linear programming render goal programming a more appropriate technique when a problem involves or calls for:

a. The coordination of activities within a firm.

b. A "satisfactory" rather than an optional solution.

c. The incorporation of several goals into the solution.

The process of formulation a goal programming problem involves performing the same initial steps that are required in linear programming. The main difference stems from the way in which goals are treated and expressed into mathematical equialities.

For illustration purposes, consider the simple one-period situation where a manager is faced with a short-term financing problem of determining how much of a raw material purchase price P to pay with cash (X_1) and how much to pay by making use of a credit line (X_2) bearing a 10 percent annual interest cost, and requiring him to maintain a minimum working capital balance of $WC.

Furthermore, assume that the manager wishes to maintain at all times a minimum cash balance of at least \$CASH. If $CASH_o$ and WC_o represent the initial amounts of cash and of working capital, the problem can be formulated as a linear programming problem where the objective is to minimize the cost of financing, i. e. the cost of making use of the credit line. Since X_2 denotes the amount of borrowed dollars, we may express the objective function as:

$$\text{Minimize } Z = .10 * X_2$$

The constraints to the problem can, in turn, be formulated as follows:

i. The sum of the cash X_1 used and the borrowed funds X_2 must equal the price P to be paid:

$$X_1 + X_2 = P$$

ii. Since a minimum working capital (current assets minus current liabilities) equal to \$WC must be maintained, we must ensure that:

$$WC_o - X_1 - X_2 \geq WC$$

or rearranging terms,

$$X_1 + X_2 \leq WC_o - WC$$

iii. The manager wishes to maintain a cash balance of at least \$CASH. Therefore, the amount of cash X_1 used should, at most, equal that amount which would deplete the present balance of \$$CASH_o$ to its minimum allowable level, i.e.:

$$CASH_o - X_1 \geq CASH$$

or

$$X_1 \leq CASH_o - CASH$$

The first two constraints can be considered as externally imposed and, therefore, as "hard" constraints. The third one, however, represents one of the manager's goals and, therefore, is not necessarily as constraining as the others. "Straight" linear programming treats all constraints equally and by so doing fails to provide a means of discriminating between "hard" and "soft" constraints. Goal programming resolves this problem by introducing into the soft constraint (cash balance goal) surplus variable y^+, to represent any excess over target amount of cash, and slack variable y^-, to denote any shortage from target. These two variables are defined as:

$$y^{+} * y^{-} = 0$$

$$y^{+} + y^{-} \geq 0$$

$$y^{+} - y^{-} = X_1 - CASH_o + CASH$$

According to this definition, at least one of the y's must be zero, both of them must be non-negative, and their difference measures the dollar value by which the ending cash balance exceed ($y^{+} > 0$ and $y^{-} = 0$) or is shart of ($y^{+} = 0$ and $y^{-} > 0$) the specified target ($CASH).

With the variables y^{+} and y^{-} thus defined, the problem can now be formulated as a goal programming one by attributing a cost c to each dollar of negative* (cash balance shortage) deviation and by expressing the objective function to minimize as:

$$\text{Minimize } Z = .10 * X_2 + c * y^{-}$$

To solve this problem by the simplex method, the other co straints need to be converted into a set of equations by introducing slack, surplus and artificial variables wherever necessary. If this is done, the formulation becomes:

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*The fact that no penalty is attached to y^{+} reflects the fact that the manager is indifferent to having an excess-over-target cash balance.

$$\text{Minimize } Z = .10 * X_2 + c * y^-$$

subject to:

$$\begin{array}{lllll} X_1 + X_2 + X_3 & & & = & P \\ X_1 + X_2 & + X_4 & & = & WC_o - W \\ X_1 & & - y^+ + y^- & = & CASH_o - CASH \end{array}$$

$$x_i, y^+, y^- \geq 0 \qquad (i = 1, 2, 3, 4)$$

In those situations in which management has several goals, some of which are given absolute priority over or relative to others, the objective function to be minimized will consist of the penalty-weighted summation of each deviation to its respective target.

B. Goal Programming Applied to Merger Packaging Analysis

Having dwelled to some extent on the nature and potential use of goal programming, let us now explore its applicability to merger packaging analysis by considering a situation involving the possible use of common stock, bonds and convertible preferred as transaction media. Also, let us assume that the acquisition transaction will take place on January first of Year 1, and that financial projections for both companies (as separate entities) extending five years into the future are available.

Of the many goals that a company might wish to achieve and which may influence the structure of the transaction package, we have considered the following in our analysis:

i. To incur an initial EPS dilution not exceeding a specified percentage.

ii. To maintain a specified percentage ownership (control) of the combined company immediately after the consummation of the merger.

iii. To maintain a given debt-to-equity ratio.

iv. To attain a target EPS level by a specified Year N.

v. To maintain a minimum working capital balance (liquidity). This goal encompasses the goal of continuing to pay a dividend stream of \$d per share (on all the shares outstanding after the acquisition).

For purposes of simplifying and making feasible our approach, we have made a series of assumptions. Firstly, for reasons which are made clear later, we have assumed that the size of the acquirer, as measured by the market value of its equity, is much larger than the seller's.

This assumption, in turn, allows us to make a second important simplification, namely, that the acquirer's common stock price will not vary with the size and composition of the issued package. Without this simplifying assumption, a few of the constraints become nonlinear, and it is no longer possible to approach the packaging problem through linear or goal programming.

Thirdly, we have assumed that the total price to pay for the acquisition will not vary with the types and amounts of securities issued as payment. To do otherwise, brings in several complications.

Fourthly, we have assumed that problems connected with the debt maturity and with the timing of the issue may be ignored.

Given these assumptions, the objective is to determine the package which minimizes the penalty-weighted sum of the deviations which may result from management's specified goals.

In order to formulate the packaging problem in terms of goal programming, it is necessary (i) to express each of management's goals as linear equations of the securities which may enter the package, and (ii) to find for each goal a way of penalizing any deviations which may result from management's specified target. In what follows, we shall do this for each goal. Let us first, however, formulate the equation governing the amounts of securities which may be used.

1. Transaction Constraint

The central constraint of the packaging problem is that the total value of the securities issued must equal the price to be paid for the acquisition. Using our own symbolism (see Appendix A) and some elements of FORTRAN notation, we may express this as:

$$CSI + B(0) + CP(0) = PRICE2$$

This equation may be viewed a priori as a "hard" constraint. However, to increase the potential uses of the proposed packaging technique, we have added surplus variable Y_1^+ to denote any discount over PRICE2 and slack variable Y_1^- to represent any premium over PRICE2. The equation thus becomes:

$$CSI + B(0) + CP(0) - Y_1^+ + Y_1^- = PRICE2$$

The addition of these two variables enables us treat the transaction constraint as a goal, that is, as a "soft" constraint the exact attainment of which might become subordinated to the attainment of other goals. In effect, if PRICE2 is specified to be zero and Y_1^+ and Y_1^- are not penalized (i.e., included in the objective function), the final value of Y_1^- will correspond to that value of PRICE2 which minimizes the sum of all deviations from their respective targets. Alternatively, if a given PRICE2 is specified, and Y_1^+ and Y_1^- are heavily penalized, their final values (if none is a basic variable) may be interpreted as the "opportunity cost", shadow price or marginal value of $1 of premium and of discount over the specified price. Be definition, only of the y's may appear at a positive value in the final solution. Then according to the marginal value concept, that value represents the amount by which the objective function would decrease with a $1 change (of premium if $Y_1^+ > 0$) or of discount if $Y_1^- > 0$) in PRICE2, provided the solution remains feasible. This value becomes very useful in determining the impact that a proposed price has on the overall attainment of management's goals.

2. Short-Term EPS Dilution Constraint

This constraint specified that earnings-per-share of the combined firms at the end of the first year (Year 1) should not be less than the fraction (1 - STDIL*) of their projected level without the merger for Company 1. STDIL* is, therefore, the maximum EPS dilution that the acquirer's management is willing to consider.

For purposes of simplicity, we include the synergistic benefits expected to accrue from the consolidation in the estimates E2(t) of earnings for the acquired firm.

The EPS constraint may be expressed as:

$$EPS3(1) \geq EPS1(1) * (1 - STDIL^{*}) \tag{1}$$

This inequality can be written in terms of the package variables as:

$$\frac{E1(1) + E2(1) - ATBIR * B(0) - CPD * CP(0)}{NOS1 + \frac{CSI}{P1}} \geq \frac{E1(1)}{NOS1}(1\text{-}STDIL^{*}) \tag{2}$$

To the extent that ATBIR * B(0) + CPD * CP(0) represents the fixed charges generated by any issue of bonds and convertible preferred at the end of Year 1, we may convert the inequality into an equality by introducing slack variable Y_2^-, to represent the amount by which fixed charges fall short, if at all, from the amount FC^* necessary to produce the maximum EPS dilution allowable ($STDIL^*$), and surplus variable Y_2^+, to represent the amount by which fixed charged may exceed FC^*. We may then write:

$$\frac{E1(1)+E2(1)-ATBIR * B(0)-CPD * CP(0)-Y_2^+ + Y_2^-}{NOS1 + \frac{CSI}{P1}} = \frac{E1(1)}{NOS1}(1\text{-}STDIL^{*}) \tag{3}$$

and rearranging terms:

$$\frac{1 - STDIL^{*}}{PE1} * CSI + ATBIR * B(0) + CPD * CP(0)$$

$$+ Y_2^{+} - Y_2^{-} = E1(1)\ STDIL^{*} + E2(1) \qquad (4)$$

As defined, Y_2^{+} and Y_2^{-} represent respectively the positive and negative deviations (excess and deficit) of fixed charges from the level FC^{*} which corresponds to an EPS dilution equal to $STDIL^{*}$. The reason for introducing deviations variables expressed in dollar units rather than in dilution percentage points stems from the necessity of expressing each goal as a linear equation of CSI, B(0), CP(0) and the pertinent deviations. The inclusion of deviation variables expressed in EPS dilution points would have, in fact, resulted in quadratic equations which are not amenable to solving through linear or goal programming. We shall see later, however, that by linearizing the goal equation, we actually non-linearize the objective function. Fortunately though, this does not constitute a grave problem.

3. Ownership Goal

This goal limits the amounts of common stock to be issued so that the acquiring company may conserve at least an immediate percentage ownership (control) equal to MINOWN% of the combined forms. We may express this as:

$$\frac{V1}{V1 + CSI} \geq \frac{MINOWN^*}{100}$$

or in terms of voting stock shares,

$$\frac{NOS1}{NOS1 + \frac{CSI}{P1}} \geq \frac{MINOWN^*}{100}$$

$$\frac{CSI}{P1} - Y_3^+ + Y_3^- = \frac{NOS1(100\text{-}MINOWN^*)}{MINOWN^*}$$

4. Solvency Goal

The goal here consists of maintaining a debt-to-equity ratio equal to DER^*. Mathematically, we may express this as:

$$\frac{D1(0) + D2(0) + B(0)}{EQ1(0) + CSI + CP(0)} = DER^* \tag{4.1}$$

Again, we introduce surplus and slack variables Y_4^+ and Y_4^- to denote respectively the excess and shortage of debt over the level D^* which, if issued, would produce in conjunction with the issued equity CSI the target debt-to-equity ratio DER^*. After rearrangement of terms, the constraint may be written as:

$$DER^{*} * CSI - B(0) + DER^{*} * CP(0) + Y_4^{+} - Y_4^{-} = D1(0) + D2(0) - DER^{*} EQ1(1)$$

5. Earnings-Per-Share Growth Goal

This goal consists of making a target amount of EPS by Year N. That is,

$$EPS3(N) \geq EPS3^{*} \tag{5.1}$$

We may express EPS3 for any year end t as:

$$EPS3(t) = \frac{E1(t) + E2(t) - ATBIR * B(t) - CPD * CP(t)}{NOS1 + \frac{CSI}{P1} + CPCR * [CP(0) - C(t)]} \tag{5.2}$$

If the bond issue has a sinking fund provision attached to it, requiring annual payments equaling a fraction SFR of the amount issued B(0), starting on Year t_1, we may then express B(t) as:

$$B(t) = \begin{cases} B(0) & \text{for } t < t_p \\ B(0)\,[1 - (t - t_1 + 1)\,SFR] & \text{for } t \geq t_p \end{cases}$$

or alternatively as:

$$B(t) = \alpha * B(0)$$

where

$$\alpha = \begin{cases} 1 & \text{for } t < t_p \\ (1 - (t - t_1 + 1)\ SFR) & \text{for } t \geq t_p \end{cases}$$

Also, if we estimate the convertible preferred shares to convert into common stock according to a schedule, where each year a given fraction β_t of the initial issue CP(0) get converted, we may then express the oustanding amount at each year-end as:

$$CP(t) = (1 - \sum_{i=1}^{t} \beta_i) * CP(0)$$

The expression inside brackets represents at any year-end t the non-converted fraction of the issue. Let us replace it by γ_t to obtain:

$$CP(t) = \gamma_t * CP(0)$$

With the expressions for B(t) and CP(t) thus expressable in terms of their respective initial issue amounts, we may write:

$$EPS3(t) = \frac{E1(t) + E2(t) - ATBIR * \alpha * B(0) - CPD * \gamma_t * CP(0)}{NOS1 + \frac{CSI}{P1} + CPCR * CP(0) * (1 - \gamma_t)}$$

Introducing surplus and slack variables Y_5^+ and Y_5^- to denote, respectively, the amounts by which earnings exceed or fall short of their target, we now have

$$EPS3^* = \frac{E1(N) + E2(N) - ATBIR * \alpha * B(0) - CPD * \gamma_t * CP(0) - Y_5^+ + Y_5^-}{NOS1 + \frac{CSI}{P1} + CPCR * CP(0) * (1 - \gamma_t)}$$

or rearranging terms

$$\frac{EPS3^*}{P1} * CSI + ATBIR * \alpha * B(0) + (CPD * \gamma_t + EPS3^*$$

$$* CPCR) * (1 - \gamma_t) * CP(0) + Y_5^+ - Y_5^-$$

$$= E1(N) + E2(N) - EPS3^* * NOS1$$

Any penalty which may be attached to the underattainment of the targeted EPS may be discounted into the present and then applied to Y_5^-.

6. Net Working Capital Goal

This goal consists in maintaining by the end of the first year the level of net working capital above a minimum WC^*. That is,

$$WC3(1) \geq WC^*$$

Taking the projected figures for working capital for companies 1 and 2, we must substract from WC1(1) the dividends which shall be paid on the issued shares and add the dividends which were projected to be paid by Company 2 to its shareholders, and which now shall be paid to the parent company.

$$\begin{aligned} WC1(1) \ - \ & DIV* \frac{CSI}{P1} \\ - \ & ATBIR * \alpha * B(0) - CPD * CP(0) \\ + \ & WC2(1) + E2(1) * PAYO2 \geq WC^* \end{aligned}$$

Introducing surplus and slack variables Y_6^+ and Y_6^- to represent respectively the excess and shortage over target of working capital we may express the goal as:

$$\frac{DIV}{P1} * CSI + ATBIR * \alpha * B(0) + CPD * CP(0)$$

$$+ Y_6^+ - Y_6^- = WC(1) + WC2(1) + E2(1) * PAYO2 - WC^*$$

So far, we have examined the various goals to be considered when structuring the merger package, and have expressed each goal as a linear equation of the package and corresponding deviation variables. Let us now consider the objective function to be minimized.

7. Objective Function

As previously stated the objective of goal programming is to determine the solution(s) which minimizes the penalty-weighted sum of the deviations which may result.

$$\text{MIN } Z_o = \sum (p_i^+ * d_i^+ + p_i^- * d_i^-)$$

where p_i^+, p_i^- denote respectively the penalities attached by management to a positive and a negative deviation from target i; and d_i^+, and d_i^- represent respectively the positive and negative deviation which may result from target i.

$$d_i = f(Y_i)$$

During the formulation of the goal equations, we saw that in most instances the deviations d_i had to be expressed in terms other than those in which the manager specifies his target. This transformation, i.e., $d_i = f(Y_i)$, while allowing us to express each goal as a linear equation, constitutes merely a trade-off, for it is done at the expense of producing a quadratic objective function of the deviation variables. Before examining what new complexities are introduced by this, and how they may be dealt with, let us explain why the objective function becomes non-linear. For that purpose, let us refer to the EPS dilution equation:

$$EPS3(1) \geq EPS1(1) * (1 - STDIL^*)$$

We converted this inequality into a linear equation by introducing surplus and slack variables Y_2^+ and Y_2^- which represent respectively the amounts by which the fixed charges resulting from any issues of bonds or convertible preferred exceed or fall short of the level FC^* which produces an EPS dilution of $STDIL^*$. The manager, however, does not penalize these amounts but rather the percentage points of EPS deviation from his target. This means then, that we have to determine the amount of fixed charges which corresponds to one percentage point of EPS dilution and then attach to it the same penalty as that which the manager attributes per point of dilution deviation. It is this basic conversion requirement that produces the problem.

Recall that the relationship between EPS dilution and fixed charges for Year 1 may be expressed as:

$$STDIL(1) = 1 - PE1 * I\left(\frac{E1(1) + E2(1) - FC(1)}{I * (V1 + PRICE2) - FC(1)}\right)$$

where I stands for the after-tax-bond-interest rate ATBIR, and the convertible preferred dividend yield CPD, here assumed for simplicity to be equal.

As can be readily appreciated, this equation has the functional form of

$$y = 1 - a\left(\frac{b - x}{c - x}\right)$$

which means that there exists a non-linear relationship between dilution percentage point and $1 of fixed charges. In non mathematical terms, this is equivalent to saying that to each EPS dilution point, there corresponds a different amount of fixed charges. Therefore, if each percentage point of dilution deviation is penalized equally, the corresponding penalty per $1 of fixed charges will be unequal and will depend on the amount of fixed charged involved. This, in fact, means that the penalty function, or in other words, the objective function, varies non-linearly with the amount of fixed charges. This situation can be shown to hold for most of the other goals.

The presence of a quadratic objective function, instead of a linear one, can be generally considered as a drawback, inasmuch as it adds a dimension of complexity to the problem and to any solution technique. In our case, however, the objective function enjoys the property of being separable, that is, of being expressable as the sum of n functions, one for each deviation variable Z_i:

$$c(Z) = \sum_{i=1}^{n} C_i (Z_i)$$

and, therefore, enables us to turn to a technique which linearly approximates the original problem and which is amenable to solving by a version of the simplex method. To keep the exposition simple, we shall describe the technique for only one variable Z and its associated function c(Z).

Based upon the knowledge that a surplus or a slack variable Z may vary between 0 and an upper-bound Z, the technique requires that a grid of values for Z, designated as:

$$0 = Z_1 < Z_2 < . . . < Z_{p-1} < Z_1 = Z$$

be selected, so that any value of Z may be expressed as a weighted average of the grid values:

$$Z = W_1 Z_1 + W_2 Z_2 + \ldots + W_1 Z_1$$

where the weights w must satisfy

$$\sum_{k=1}^{p} W_k = 1 \qquad \text{and} \qquad W_k \geq 0 \text{ for } k = 1, 2, \ldots p$$

In selecting the grid, it is practical to locate no more than two grid points in any interval of values for Z, where the non-linear function c(Z) behaves in a linear fashion.

To construct the "approximate" mode, Z must be replaced by its new expressed in the goal equation; the restriction on the weights W_k needs to be included as a new constraint; and the non-linear function c(z) in the objective function must be substituted by the piecewise-linear or polygonal, approximation:

$$\sum_{k=1}^{p} c\, W_k Z_k$$

To illustrate the construction, consider again the EPS dilution goal equation in its functional form:

$$y = 1 - a \frac{b - x}{c - x}$$

Let p be the penalty per percentage point of positive deviation from target y^*. Then letting c denote the total penalty, we have that

$$\frac{dc}{dy} = p$$

Since

$$dy = a \frac{c - b}{(c - x)^2} \quad dx$$

Then

$$\frac{dc}{dx} = pa \frac{c - b}{(c - x)^2}$$

and the total penalty due to a deviation $x - x^*$ is

$$C = pa\,(c - b) \int_{x^*}^{x} \frac{ds}{(c - s)^2}$$

$$= pa\,(c - b) \quad \frac{1}{c - x} - \frac{1}{c - x^*}$$

$$= pa \frac{(c - b)}{(c - x^*)} * \frac{x - x^*}{c - x}$$

Be definition $Z^{+} = x - x^{*} \geq 0$. Replacing,

$$c(Z^{+}) = pa * \frac{(b - x)}{(c - x^{*})} * \frac{Z^{+}}{x^{*} - Z^{+}}$$

This function has the following graph for $Z^{+} \leq x^{*}$.

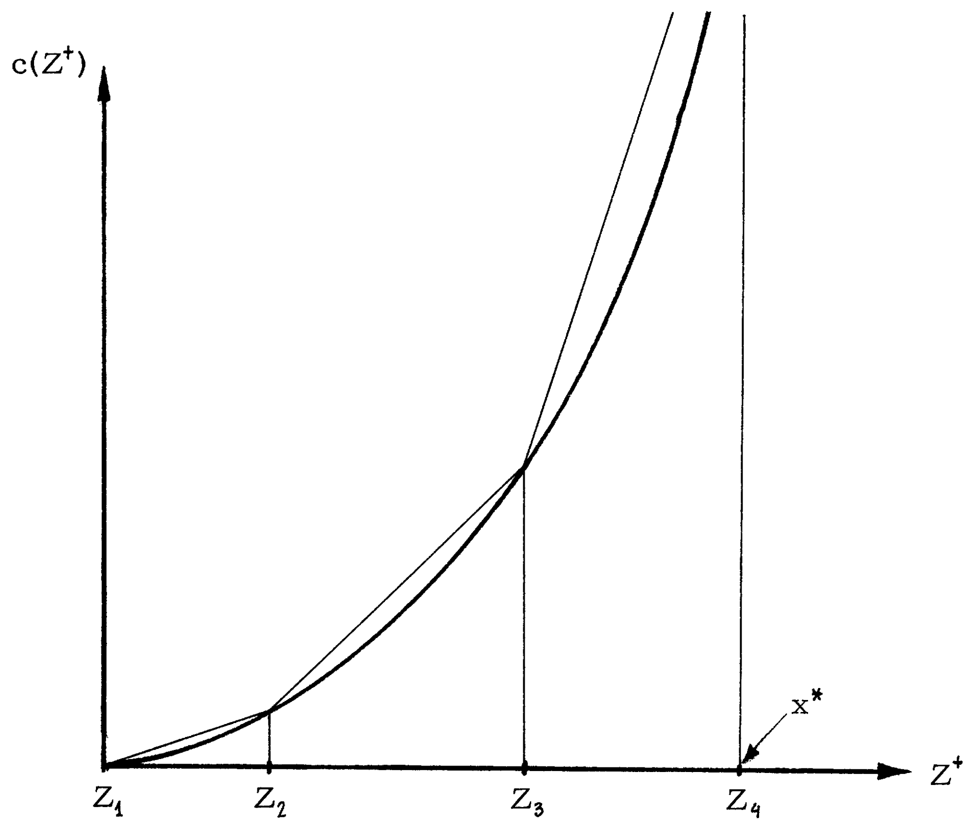

Figure 7-1

Having selected the grid of values Z_1, Z_2, Z_3 and Z_4, we may write any Z^+ as:

$$Z^+ = W_1^+ Z_1 + W_2^+ Z_2 + W_3^+ Z_3 + W_4^+ Z_4$$

The objective function becomes:

$$C(W^+) = pa \frac{(b - c)}{(c - x*)} \quad 0 * W_1^+ + \frac{Z_2}{x* - Z_2} W_2^+ + \frac{Z_3}{x* - Z_2} W_3^+$$
$$+ \frac{Z_4}{x* - Z_4} W_4^+$$

and the corresponding goal equation becomes:

$$\frac{1 - STDIL^*}{PE1} * CSI + ATBIR * B(0) + CPD * CP(0) + W_1^+ Z_1$$
$$+ W_2^+ Z_2 + W_3^+ Z_2 + W_4^+ Z_4 - Y_2^-$$
$$= E1(1) * STDIL^* + E2(1)$$

These equations are now linear functions of CSI, B(0), CP(0), W_1^+, W_2^+, W_3^+, W_4^+ and Y_2^-.

We have illustrated how the quadratic expression of any penalty function can be linearized by substituting it by a piecewise-linear approximation. Under this new form, the problem can be solved as a linear programming one. However, in order for us to do so with our problem, we first have to linearize the penalty functions of all the deviations which may be penalized. Let us make a rough estimate of what impact this may have on the problem. Basing ourselves upon the knowledge that linearization is required in the case of three goals, and hence for six penalty functions (each goal has a surplus and slack variable) and furthermore, assuming that three grid values will be required to piecewise linearize each penalty function, it is possible to estimate that at least eighteen new variables (24 new ones minus the six being linearized) and six new constraints will be added to the probme.

The inclusion of these many additional variables and constraints not only adds complexity to the envisioned solution technique, but also increases the time, and thus the cost, needed to arrive at a solution. In order to avoid this, we have tried to determine (i) to what extent the penalty functions behave nonlinearly in their respective intervals, and (ii) what assumptions must be made so that each function may be substituted by a one-segment, or at most, by a two-segment linear approximation. In what follows, we proceed to determine this for each of the three nonlinear penalty functions.

C. Linearization of Penalty Functions

1. EPS Dilution Penalty Function

We have already seen in previous illustrations how the short-term EPS dilution which may result from issuing a given package can be expressed as a function of the fixed charged that the package may engender.

$$y = 1 - a\left(\frac{b - x}{c - x}\right)$$

where

y = short-term dilution

x = fixed charged

a = PE1 * I

b = E1(1) + E2(1)

c = I(V1 + PRICE2)

I = after-tax-bond interest-rate = convertible referred divident yield

The graph of the function for $0 \leq x \leq$ I * PRICE2 looks like for different I's:

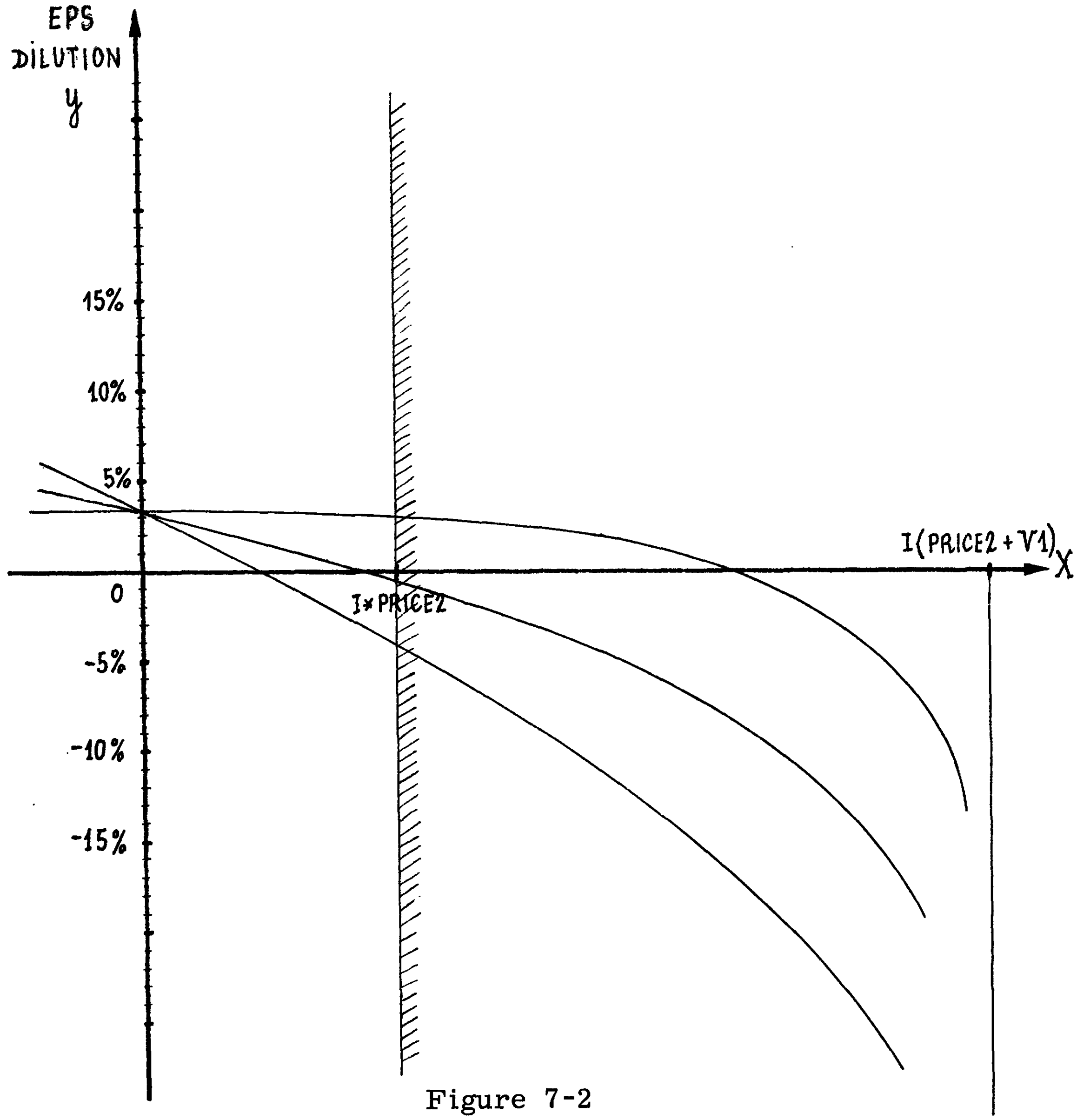

Figure 7-2

In order to determine whether y lends itself to a linear approximation within the pertinent interval of x, we need to examine the variation of the first-order derivative within the interval, or alternatively, check whether the absolute value of the second-order derivative remains throughout the interval smaller than a very small number ε . Mathematically, we express this as:

$$\frac{dy}{dx} = \frac{-a\,(b - c)}{(c - x)^2} = \text{constant} \qquad \text{for } 0 \leq x \leq I * \text{PRICE2}$$

or whether

$$\frac{d^2y}{dx^2} = \frac{2a\,(b - c)}{(c - x)^3} \leq \varepsilon \qquad \text{for } 0 \leq x \leq I * \text{PRICE2}$$

Testing for the last condition, we may replace each parameter by its corresponding expression to obtain:

$$\frac{\text{PE1}}{I} * \frac{\dfrac{\text{E1(1)} + \text{E2(1)}}{I} - (\text{V1} + \text{PRICE2})}{(\text{V1} + \text{PRICE2})^3 * \left(1 - \dfrac{X}{I(\text{V1} + \text{PRICE2})}\right)^3} \leq \frac{\varepsilon}{2}$$

The left-hand side of this inequality will tend to be small if (i) I is close to the rate which the market is capitalizing the purchaser's earnings: (ii) if the buying company's value is much higher than the seller's price; (iii) if the amount of debt (bonds and convertible preferred) issued constitutes a small fraction of the total package.

Assuming that at least one of these conditions holds, we may linearize y by approximating it by a single linear segment passing by the point (x^*, y^*) and having a slope equal to the value of the first-order derivative evaluated at x^*. The equation of such a linear segment is:

$$(y - y^*) = \frac{-a\,(b - c)}{(c - x)^2}\,(x - x^*) \qquad \text{for } 0 \leq x \leq I * \text{PRICE2}$$

By definition

$$Y_2^+ = x - x^* \qquad \text{when } x^* \leq x \leq I * \text{PRICE2}$$

and

$$Y_2^- = x - x^* \qquad \text{when } 0 \leq x \leq x^*$$

Therefore, after replacing each parameter by its expression, we may write

$$C_2\,(Y^+{}_2) = \frac{\left[\dfrac{P1 * NOS1}{E1(1)} * I - (1. - STDIL^*)\right]^2}{\dfrac{P1 * NOS1}{E1(1)} * I\left[I\,(V1 + PRICE2) - E1(1) - E2(1)\right]} * Y^+_2$$

and

$$C_2\,(Y_2^-) = \frac{\left[\dfrac{P1 * NOS1}{E1(1)} * I - (1. - STDIL^*)\right]^2}{\dfrac{P1 * NOS1}{E1(1)} * I\left[I\,(V1 + PRICE2) - E(1) - E2(1)\right]} * Y^-_2$$

The penalty $Z(Y_2^+)$ due to a positive derivation from x^* is:

$$Z(Y_2^+) = \frac{p_2^+}{100} * C_2(Y_2^+)$$

where p_2^+ is the penalty management associated with each percentage point of excess short-term EPS dilution.

Correspondingly, the penalty given a deficitary amount of fixed charges, if at all penalized, is:

$$Z(Y_2^-) = \frac{p_2^-}{100} * C_2(Y_2^-)$$

where p_2^- = the specified penalty per percentage point of underattainment.

2. Ownership Penalty Function

Proceeding again along the same lines, we express the resulting ownership percentage as a function of the amount ISH of shares issued:

$$OWN = \frac{NOS1}{NOS + CSI/P1} = \frac{NOS1}{NOS1 + ISH}$$

The first and second-order derivatives are:

$$\frac{d\,OWN}{d\,ISH} = \frac{-\ NOS1}{(NOS1 + ISH)^2} < 0$$

$$\frac{d^2\,OWN}{d\,ISH^2} = \frac{NOS1}{(NOS1 + ISH)^3} > 0$$

The graph of the function looks like:

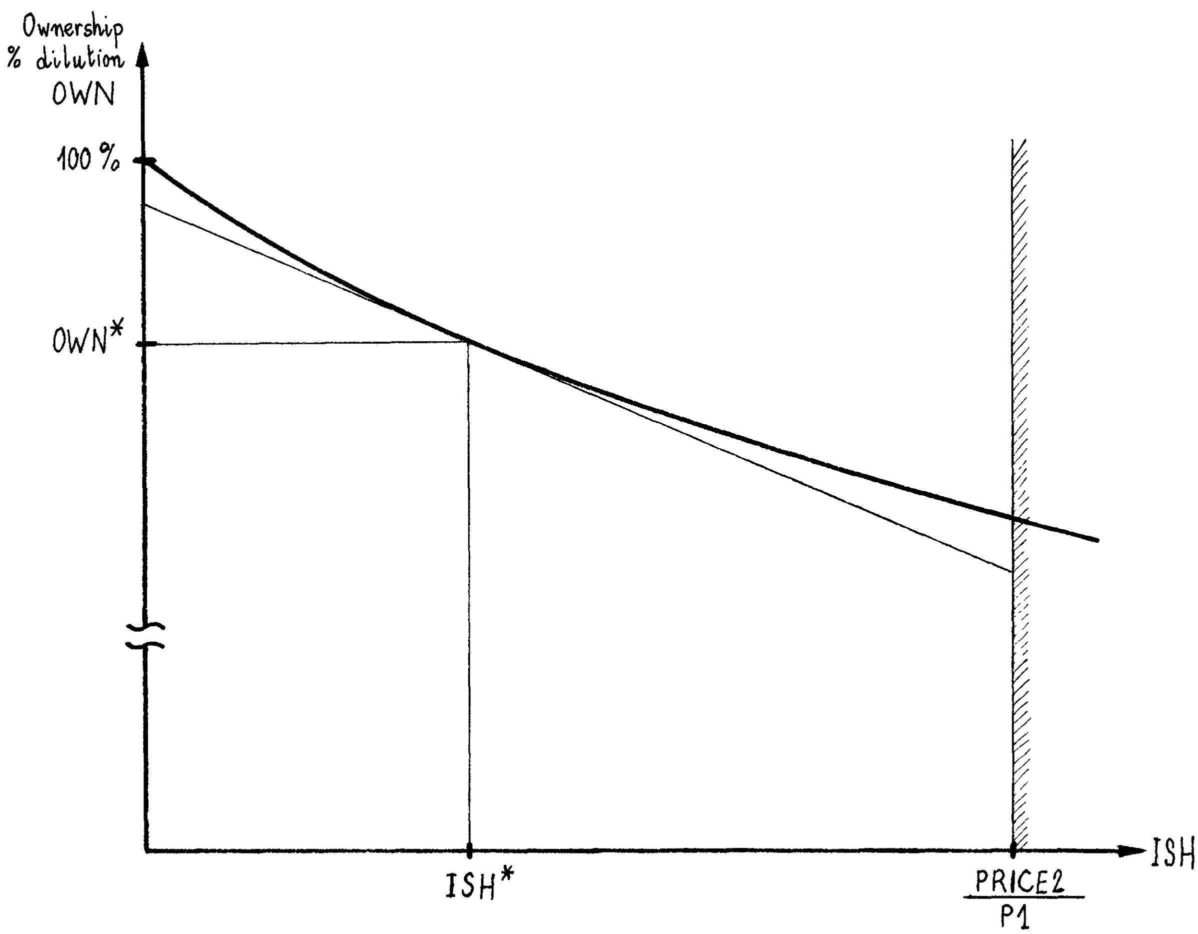

Figure 7-3

(continued on page 167)

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It is clear both the expressions for the first- and second-order derivatives that we may approximate the OWN curve by a linear segment if (i) the buying company's number of outstanding shares NOS 1 is great and/or if (ii) the number ISH of issued shares is small in relation to NOS 1.

Assuming that these circumstances hold, the equation for the linearizing segment can be expressed:

$$(OWN - OWN^{*}) = \frac{NOS\,1}{(NOS\,1 + ISH^{*})^{2}} \; (ISH - ISH^{*})$$

The corresponding penalty costs for a positive and negative deviation from OWN^{*} are

$$Z(Y_3^{+}) = \frac{p_3^{+}}{100} * C(Y_3^{+}) = \frac{p_3^{+}}{100} * \frac{NOS\,1}{(NOS\,1 + ISH^{*})^{2}} * Y_3^{+}$$

$$= \frac{p_3^{+}}{100} * \frac{OWN^{*2}}{NOS\,1} * Y_3^{+}$$

$$Z(Y_3^{-}) = \frac{p_3^{-}}{100} * C(Y_3^{-}) = \frac{p_3^{-}}{100} * \frac{NOS\,1}{(NOS\,1 + ISH^{*})^{2}} * Y_3^{-}$$

$$= \frac{p_3^{-}}{100} * \frac{OWN^{*2}}{NOS\,1} * Y_3^{-}$$

3. Solvency Penalty Function

Expressing the debt-to-equity ratio as a function of the amount X of debt which may be issued yields:

$$DER = \frac{D1(0) + D2(0) + X}{EQ(1) + (PRICE2 - X)}$$

The first- and second-order derivatives of this function are:

$$\frac{d\,DER}{d\,X} = \frac{D1(0) + D2(0) + EQ1(0) + PRICE2}{(EQ1(0) + PRICE2 - x)^2} > 0$$

$$\frac{d^2\,DER}{d\,X^2} = \frac{2\,(D1(0) + D2(0) + EQ1(0) + PRICE2)}{(EQ1(0) + PRICE2 - X)^3} > 0$$

The graph of the pertinent curve looks like:

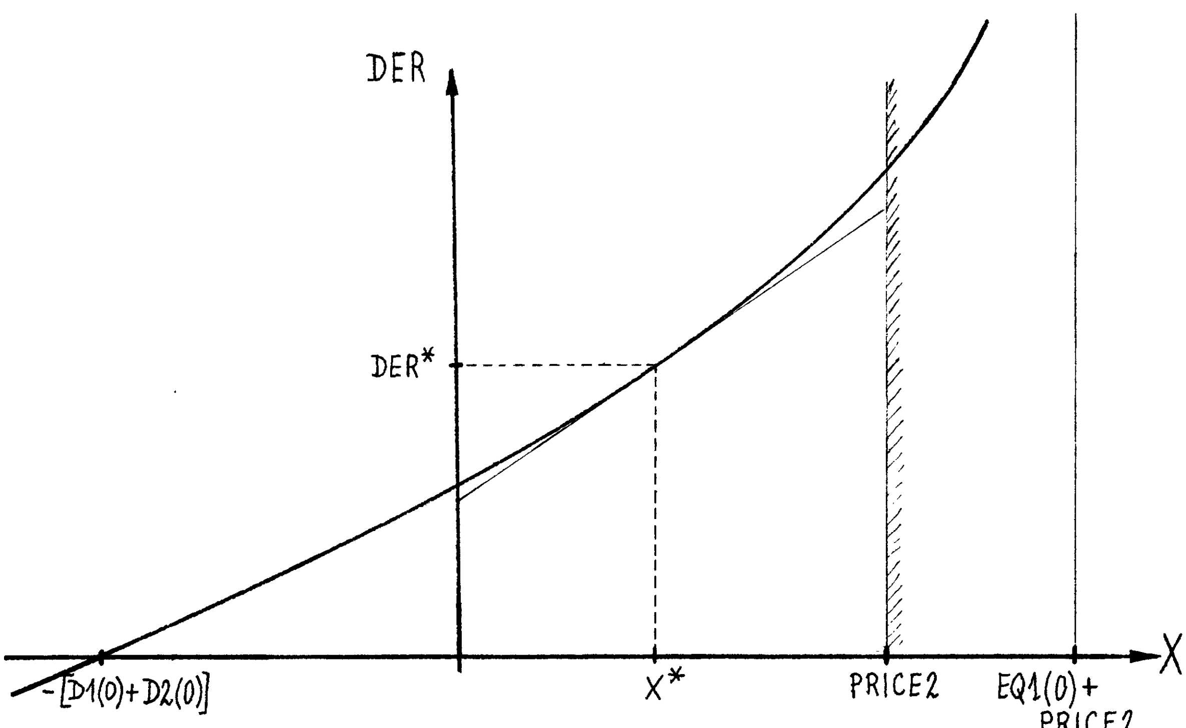

Figure 7-4

Inspection of the expression for the second-order derivatives reveals that within the $0 \leq x \leq$ PRICE2 interval, the curve may be approximated by a linear segment only (i) if the buying company is much larger than the selling one and (ii) if both the purchasing and selling companies possess nearly non-leveraged financial structures. For those few cases where both of these conditions hold, the equation for the pertinent linear segment can be written as:

$$(DER - DER^{*}) = \frac{D1(0) + D2(0) + EQ1(0) + PRICE2}{(EQ1(0) + PRICE2 - X^{*})^{2}} (X - X^{*})$$

For those other cases, where the second condition does not hold, we have resorted to piecewise linearizing the penalty function by two segments, as illustrated below:

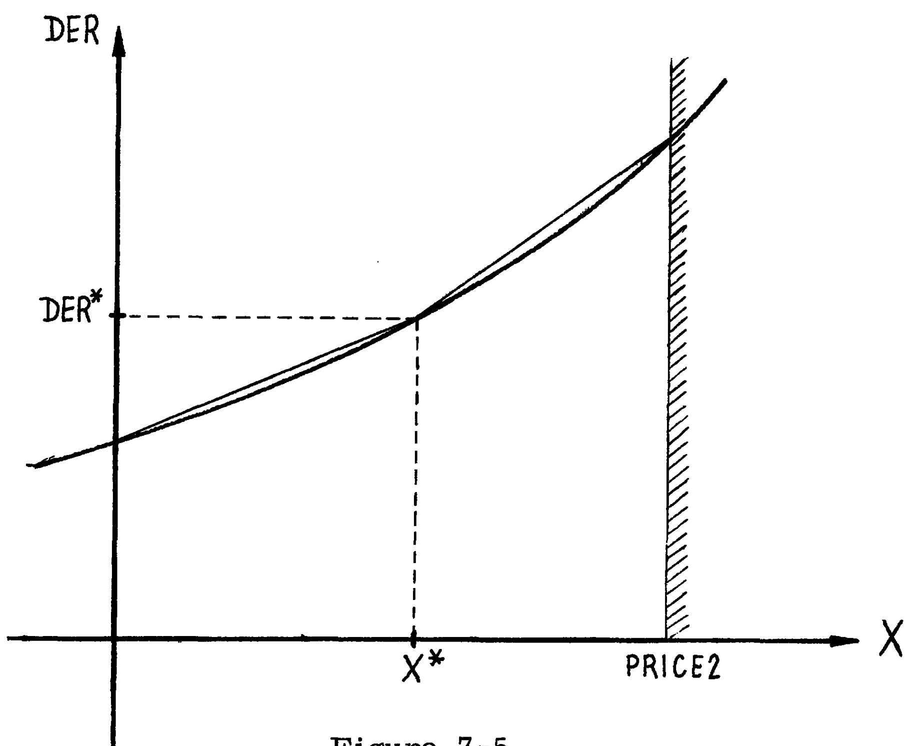

Figure 7-5

By linearizing DER in this simple manner, we avoid introducing new variables and constraints to the problem. The equation for a positive deviation from DER^* becomes:

$$DER - DER^* = \frac{1 + DER^*}{EQ1(0)} * (X - X^*) \quad \text{for } X^* \leq X \leq PRICE2$$

and replacing $X - X^*$ by Y_4^+,

$$C_4(Y_4^+) = DER - DER^* = \frac{1 + DER^*}{EQ1(1)} * Y_4^+$$

The penalty to any amount Y_4^+ is then

$$Z(Y_4^+) = \frac{p_4^+}{100} * C(Y_4^+) = \frac{p_4^+}{100} * \frac{1 + DER^*}{EQ1(1)} * Y_4^+$$

where p_4^+ denotes the penalty attached per percentage point of excess debt-to-equity ratio.

Correspondingly, the equation for a negative derivation from DER^* is:

$$DER - DER^* = \frac{1 + DER^*}{(EQ1(1) + PRICE2)} * (X - X^*) \text{ for} 0 \leq X \leq X^*$$

and replacing $X - X^*$ by Y_4^-, we have

$$C(Y_4^+) = DER - DER^* = \frac{1 + DER^*}{EQ1(1) + PRICE2} * Y_4^+$$

The penalty due to any shortage of debt issued is

$$Z(Y_4^-) = \frac{p_4^-}{100} * \frac{1 + DER^*}{EQ1(1) + PRICE2} * Y_4^-$$

where p_4^- represents the penalty attached to each percentage point below the target debt-to-equity ratio DER^*.

Having substituted each nonlinear penalty function by a piecewise linear approximation, we may finally express the objective function as a linear equation of the positive and negative deviations from each goal:

$$\text{Min } Z_o = \sum_{i=1}^{6} \left[p_i^+ * C_i(Y_i^+) + p_i^- * C_i(Y_i^-) \right]$$

where

$$C_1(Y_1^+) = Y_1^+$$

$$C_1(Y_1^-) = Y_1^-$$

$$C_2(Y_2^+) = \frac{\left[\frac{P1 * NOS1}{E1(1)} * I - (1. - STDIL^*) \right]^2}{\frac{P1 * NOS1}{E1(1)} * I \left[I\ (V1 + PRICE2) - E1(1) - E2(1) \right]} * Y_2^+$$

$$C_2(Y_2^-) = \frac{\left[\frac{P1 * NOS1}{E1(1)} * I - (1. - STDIL^*)\right]^2}{\frac{P1 * NOS1}{E1(1)} * I \left[I\,(V1 + PRICE2) - E1(1) - E2(1)\right]} * Y_2^-$$

$$C_3(Y_3^+) = ((OWN^*)^2 / 100 * NOS1) * Y_3^+$$

$$C_3(Y_3^-) = ((OWN^*)^2 / 100 * NOS1) * Y_3^-$$

$$C_4(Y_4^+) = (100 * (1 + DER^*) / EQ1(1)) * Y_4^+$$

$$C_4(Y_4^-) = (100 * (1 + DER^*) / (EQ1(1) + PRICE2)) * Y_4^-$$

$$C_5(Y_5^+) = Y_5^+$$

$$C_5(Y_5^-) = Y_5^-$$

$$C_6(Y_6^+) = Y_6^+$$

$$C_6(Y_6^-) = Y_6^-$$

CHAPTER VIII

The Use of Computers in Merger Analysis

A. Introduction

The purpose of this chapter is to examine the potential uses of computers in financial acquisition analysis. Thus far, we have presented several methods for acquisition valuation purposes, and have proposed a normative framework for such kind of analysis. In this chapter, we intend to examine to what extent computers can and/or are being used in merger analysis as an aid to decision-making.

We begin by briefly reviewing some of the characteristics of merger analysis which make computers especially appropriate tools at all stages of the analysis. The discussion continues with an evaluation of the pros and cons that the use of computers may present.

After examining the major characteristics and differences of the available programs, each program is described in terms of its purpose, scope and input/output features and requirements. A brief critique follows each such description.

Lastly, we discuss how the several programs may be used within the analytical framework proposed in Chapter VI. We conclude the chapter with a concise comparison of the programs described.

The sources of information which were tapped to obtain the material herein presented consist mainly of articles having appeared in financial and accounting journals from 1967 to date. Most articles focus primarily on the potential applications of the programs, and do not contain information related to program costs, programming languages, program sizes, etc.

Our presentation is limited to what information we found available.

1. Characteristics of Merger Analysis

The use of computers as an aid to executive decision-making has led to significant improvements in the quality, breadth and depth of merger analysis, especially in the financial area. These improvements, moreover, have been accompanied by equally significant cost reductions.

Typically, the analysis of an acquisition or a merger candidate consumes large quantities of a company's high level line, staff and consulting professionals' time. This stems from the inherent characteristics of and circumstances under which the analysis is usually performed:

i. A great need for secrecy, particularly since the stock price of the buyer might be affected one way or another by speculative trading either in contemplation of possible merger or even by rumored or actual discontinuance of interest or consideration.

ii. Ever-changing input data.

iii. Consideration of a great number of financial and non-financial topics.

iv. Considerable uncertainty as to the impact of the merger on future financial results.

v. The need to examine a wide variety of possible alternative exchange packages.

vi. A considerable amount of computation.

To these characteristics, it is necessary to add the fact that the acquisition study group typically consists of only a few people. This manpower constraint limits the amount of time available for analysis and as a result, the financial aspects of the acquisition are often not given the same depth of scrutiny as the other areas of merger analysis, such as market potential, organization, product-fit, and personnel requirements.

2. Advantages and Disadvantages of Computer Analysis

The computer's advantages in acquisition analysis include the following:

i. The analysis is performed consistently and quickly.

ii. A considerable amount of executive time is freed for use in other key analysis areas.

iii. Greater secrecy, even if the actual operations of the computer are not performed by personnel in management's confidence (e.g., computer staff and operators).

iv. A greater variety of assumptions and payment alternatives may be considered.

The potential disadvantages to computer analysis stem from the attitude of the people involved, rather than from the computer itself. These may be:

i. The placement of undue weight on the numbers when making decisions.

ii. The analysis may bog down because too many alternatives are considered and the analyst and decision-maker become inundated with printouts or because they become so intrigued with examining alternatives they forget that a decision has to be made.

iii. Problems can arise in shifting from manual to computer analysis, especially if the merger analysts do not write the programs.

iv. Computer programs fix the mode of analysis and the key variables to use. The analysis framework adopted in a program may not fit the user's requirements.

3. <u>Characteristics and Differences of Available Programs</u>

A number of standard programs are available for computer analysis which can be used by most companies in their present form or with slight modifications. Because of the large number of calculations required in acquisition analysis, most programs adopt a simulation approach to forecast the future operations and financial results of a company.

The first and major difference between the various merger programs in existence is their purpose and scope. Some programs serve to perform preliminary investigations of a wide range of issues, while others perform detailed investigations of only a few issues. There are only a few programs which may be used to analyze a wide number of considerations in depth.

A second major difference between the programs concerns the amount and type of information required before they can be used. Some programs require estimates about the future; others require past data and obtain their projections by extrapolating past trends.

A third principal difference relates to the mode in which the programs are designed to be run. Some are programmed to be run in a batch processing environment, whilst others are designed for interactive usage. We shall provide comments on this technique as part of the description of the FUSION program. (Chapter IX, Section 1)

The fourth difference between the programs relates to the amount,detail and flexibility of their respective outputs. Clearly, more detailed results are required from in-depth analyses than from preliminary investigations. Also, more flexibility in the choice of possible output formats is required from interactive programs than from batch-mode ones.

A fifth difference between programs concerns their ability to take uncertainty into consideration when performing the analysis. Most of the programs in existence make their calculations in a deterministic fashion, i.e., the values entered into the program as assumed to have no uncertainty associated with them. Hence, in order for an analyst to get a feeling of the range of possible values that a variable may assume in the future, he must run the program over and over again, using different combinations of input values every time.

B. The Available Programs

The description of the programs which we were able to review will be given in terms of the purpose, scope, logic, types of output and amount of information required by each. We shall start with the programs which are available for batch-processing applications, and then describe those which are meant to be run in an interactive mode. A short critique will follow each description. In those cases where the programs were not named, we have referred to them by the name of their author(s). In all cases, our presentation is based upon the description provided by the authors. We refer the reader to the pertinent articles for more details.

1. The McKinsey Program[1]

The McKinsey Program is a computer model developed during 1968 and 1969 which "combines long-range planning with individual candidate analysis". It enables a potential acquirer to asses its actual needs for acquisition in the context of its overall corporate objectives and alternative growth opportunities.

The model requires the chief executive officer to examine the company's long-range growth goals and decide if they can be met by internal growth before he considers following the acquisition route. If he decides he must look outside to achieve his goals, the model allows

[1]Richard W. Kraber, "Acquisition Analysis: New Help from your Computer", Financial Executive, March 1970.

him to test the compatibility of a possible acquisition, viewed both in terms of its impact on parent and candidate stockholders and on the corporation's capital structure and future acquisition plans.

In order to use the McKinsey Program, a company needs to follow the following five steps:

Step 1: Develop a Corporate Growth Plan

In order to determine whether internal growth alone fulfills the corporate objectives, the company must collect current data and develop a range of projections for its performance for the next five to ten years. The pertinent data to use for this purpose is presented in the left-most column of Exhibit 1, where for simplicity, single point estimates have been used. In a real case, a range of projections may be developed for each year.

Using these numbers as input data, the computer model simulates the operations of the firm and develops a six-year picture of the firm's income statement, balance sheet and funds flow statement (see Exhibit 2). The output figures can then be analyzed and compared against the firm's corporate financial objectives and policies. If internal growth alone does not suffice to meet the company's long-range goals, the firm must take the next step and move towards an integrated acquisition program.

EXHIBIT 1

CURRENT AND PROJECTED FINANCIAL DATA

	Superior Tree	Typical Home Building Company	Deluxe Homes
Status at end of 1968			
Sales (millions)	$100	$30	$35
Common shares outstanding	1,000,000	1,000,000	1,000,000
Common dividend per share	$1.92	$1.16	$1.00
Common stock price	$84	$53	$40
Price/earnings ratio	20	20	20
Earnings per share	$4.20	$2.65	$2.00
Working capital (millions)	$20	$24	$7
Fixed assets (millions)	$80		$28
Debt (millions)	$20	$8	$18
Debenture (millions)	$5*	0	0
Preferred stock (millions)	$5**	0	0
Common stock and retained earnings (millions)	$70	$16	$17
Projected Performance 1969-1974			
Sales annual compounding growth rate	10%	17%	18%
Profit before interest and tax as a percent of sales	10%	20%	15%
Average interest on debt	7%	7%	7%
Average tax rate	50%	50%	50%
Price/earnings ratio	20	20	20
Working capital-to-sales ratio	.2		.2
Fixed assets-to-sales ratio	Declining to .6 by 1974	.8	.8
Dividend payout as a percent of EPS after preferred dividends	50%	40%	40%
Issuance of Common Stock	None	None	$5 million in 1969 and $10 million in 1972

*50,000 debenture shares convertible into 100,000 shares of common; interest per debenture share is $5; issue callable in 1971 at $160 per share.

**50,000 preferred shares convertible into 100,000 shares of common; dividend per preferred share is $4; issue callable in 1970 at $170 per share.

EXHIBIT 2

FINANCIAL PICTURE OF SUPERIOR TREE BEFORE ACQUISITIONS

	1969	1970	1971	1972	1973	1974	
INCOME STATEMENT							
SALES	110.00	121.00	133.10	146.41	161.05	177.16	
PROFIT BEF INT + TAX	11.00	12.10	13.31	14.64	16.11	17.72	
INT ON DEBT + DEBNTUR	1.89	2.12	2.08	2.27	2.44	3.09	
PROFIT AFT INT + TAX	4.56	4.99	5.62	6.19	6.83	7.32	
OTHER AFTER TAX INCOME	0.	0.	0.	0.	0.	0.	
PREFERRED DIVIDENDS	0.20	0.	0.	0.	0.	0.	
NUMB OF COM SH OUTSTNG	1.00	1.10	1.20	1.20	1.20	1.20	
EPS AFTER PFD DIV	**4.36**	**4.54**	**4.68**	**5.16**	**5.69**	**6.10**	6% year
COM DIV/SHARE	2.18	2.27	2.34	2.58	2.85	3.05	
COM SH OVERHANG	0.20	0.10	0.	0.	0.	0.	
EPS AFT PFD + DEB CONV	3.90	4.26	4.68	5.16	5.69	6.10	
COM STOCK PRICE	87.10	90.77	93.62	103.10	113.88	121.92	
FUNDS FLOW							
RETAINED EARNINGS	2.18	2.50	2.81	3.09	3.42	3.66	
PLUS COM STK ISS/REPUR	0.	0.	0.	0.	0.	0.	
LESS INCR IN WRKNG CAP	2.00	2.20	2.42	2.66	2.93	3.22	
LESS INCR IN FIXED AST	3.60	3.52	3.39	3.19	2.93	9.66	
NET FUNDS FLOW	–3.42	–3.22	–3.00	–2.76	–2.44	–9.23	
BALANCE SHEET							
WORKING CAPITAL	22.00	24.20	26.62	29.28	32.21	35.43	
FIXED ASSETS	83.60	87.12	90.51	93.70	96.63	106.29	
DEBT	23.42	26.65	29.65	32.41	34.85	**44.08**	31%
DEBENTURES	5.00	5.00	0.	0.	0.	**0.**	
PREFERRED STOCK	5.00	0.	0.	0.	0.	**0.**	
COM STK + RET EARN	72.18	79.67	87.48	90.58	93.99	**97.65**	69%

SUPERIOR DEBENTURE ISSUE #1 CONVTD IN 1971
SUPERIOR PREFERRED ISSUE #1 CONVTD IN 1970

Table 8-2

Step 2: Develop an Acquisition Growth Strategy

The acquisition staff returns to the computer and determines whether a hypothetical multi-acquisition program can help the firm achieve its objectives. This requires that the financial characteristics of a typical company operating in the industry grouping that the firm wishes to enter be determined. These figures are then entered into the computer, which performs several test-runs using different combinations of acquisitions and assuming different timings for the acquisitions (see Exhibit 3).

If no feasible program results in the attainment of corporate objectives, the firm must decide whether to supplement the acquisition program with diversification into other industries or to revise corporate objectives.

Step 3: Screen the Many to Find a Few

With an acquisition program that integrates diversification ambitions with the firm's internal growth, the staff must now seek out the most attractive acquisition candidate.

Using published data, the staff must develop forecasts for profit growth by providing forecasts for the next six years for each of its basic components: sales, profit margin, interest cost, tax rate, etc.

The information is then fed into the program which produces a six-year income statement, balance sheet, and funds flow for the candidate (see Exhibit 4).

EXHIBIT 3

SUPERIOR ACQUIRING A TYPICAL HOME BUILDING COMPANY IN 1969, 1970, AND 1971

	1969	1970	1971	1972	1973	1974	
INCOME STATEMENT							
SALES	145.10	203.13	277.25	315.06	358.37	408.02	
PROFIT BEF INT + TAX	18.02	28.53	42.14	48.37	55.57	63.89	
INT ON DEBT + DEBNTUR	3.56	6.03	8.90	9.95	11.13	12.95	
DEPR OF WRITTEN-UP AST	0.17	0.37	0.64	0.71	0.71	0.71	
PROFIT AFT INT + TAX	7.15	11.06	16.30	18.85	21.86	25.11	
OTHER AFTER TAX INCOME	0.	0.	0.	0.	0.	0.	
GOODWILL AMORTIZATION	0.17	0.37	0.64	0.71	0.71	0.71	
PREFERRED DIVIDENDS	0.20	0.	0.	0.	0.	0.	
NUMB OF COM SH OUTSTNG	1.63	2.45	3.35	3.35	3.35	3.35	
EPS AFTER PFD DIV	**4.16**	**4.36**	**4.67**	**5.41**	**6.31**	**7.28**	10% year
COM DIV/SHARE	2.08	2.18	2.33	2.70	3.15	3.64	
COM SH OVERHANG	0.20	0.10	0.	0.	0.	0.	
EPS AFT PFD + DEB CONV	3.88	4.24	4.67	5.41	6.31	7.28	
COM STOCK PRICE	87.28	91.53	98.02	119.00	138.76	160.06	
FUNDS FLOW							
RETAINED EARNINGS	3.39	5.35	7.83	9.07	10.57	12.20	
PLUS COM STK ISS/REPUR	0.	0.	0.	0.	0.	0.	
PLUS WRTN-UP AST DEPR	0.17	0.37	0.64	0.71	0.71	0.71	
PLUS GOODWILL AMORTIZ	0.17	0.37	0.64	0.71	0.71	0.71	
LESS INCR IN WRKNG CAP	2.00	2.20	2.42	2.66	2.93	3.22	
LESS INCR IN FIXED AST	7.63	13.07	20.14	22.80	25.86	36.50	
NET FUNDS FLOW	–5.96	–9.18	–13.45	–14.96	–16.79	–26.09	
BALANCE SHEET							
WORKING CAPITAL	22.00	24.20	26.62	29.28	32.21	35.43	
FIXED ASSETS	111.68	152.83	205.82	228.62	254.49	290.99	
WRITTEN-UP ASSETS	4.86	10.58	17.08	16.36	15.65	14.94	
GOODWILL	4.86	10.58	17.08	16.36	15.65	14.94	
DEBT	47.21	82.34	126.85	141.82	158.61	**164.70**	52%
DEBENTURES	5.00	5.00	0.	0.	0.	**0.**	
PREFERRED STOCK	5.00	0.	0.	0.	0.	0.	
COM STK + RET EARN	126.39	199.80	285.83	294.90	305.47	**317.67**	48%
SURPLS FROM ACQ	–40.20	–88.95	–146.08	–146.08	–146.08	**–146.08**	

SUPERIOR DEBENTURE ISSUE #1 CONVTD IN 1971
SUPERIOR PREFERRED ISSUE #1 CONVTD IN 1970

Table 8-3

EXHIBIT 4

FINANCIAL PROJECTIONS FOR DELUXE HOMES

	1969	1970	1971	1972	1973	1974	
INCOME STATEMENT							
SALES	41.30	48.73	57.51	67.86	80.07	94.48	
PROFIT BEF INT + TAX	6.20	7.31	8.63	10.18	12.01	14.17	
INT ON DEBT + DEBNTUR	1.25	1.66	2.14	1.99	2.65	3.43	
PROFIT AFT INT + TAX	**2.47**	**2.83**	**3.24**	**4.09**	**4.68**	**5.37**	18%
OTHER AFTER TAX INCOME	0.	0.	0.	0.	0.	0.	
PREFERRED DIVIDENDS	0.	0.	0.	0.	0.	0.	
NUMB OF COM SH OUTSTNG	1.12	1.12	1.12	1.30	1.30	1.30	
EPS AFTER PFD DIV	2.20	2.51	2.88	3.15	3.61	4.14	
COM DIV/SHARE	1.00	1.00	1.15	1.26	1.44	1.65	
COM SH OVERHANG	0.	0.	0.	0.	0.	0.	
EPS AFT PFD + DEB CONV	2.20	2.51	2.88	3.15	3.61	4.14	
COM STOCK PRICE	43.98	50.24	57.69	63.08	72.12	82.74	
FUNDS FLOW							
RETAINED EARNINGS	1.35	1.70	1.95	2.46	2.81	3.22	
PLUS COM STK ISS/REPUR	5.00	0.	0.	10.00	0.	0.	
LESS INCR IN WRKNG CAP	1.26	1.49	1.75	2.07	2.44	2.88	
LESS INCR IN FIXED AST	5.04	5.95	7.02	8.28	9.77	11.53	
NET FUNDS FLOW	**0.05**	**–5.74**	**–6.83**	**2.11**	**–9.41**	**–11.19**	
BALANCE SHEET							
WORKING CAPITAL	8.26	9.75	11.50	13.57	16.01	18.90	
FIXED ASSETS	33.04	38.99	46.00	54.29	64.06	75.59	
DEBT	17.95	23.69	30.51	28.41	37.81	**49.00**	52%
DEBENTURES	0.	0.	0.	0.	0.	**0.**	
PREFERRED STOCK	0.	0.	0.	0.	0.	**0.**	
COM STK + RET EARN	23.35	25.04	26.99	39.45	42.26	**45.48**	48%

Table 8-4

Step 4: Analyze Financial Impact of Candidates

This step requires that the exchange terms which will most effectively satisfy the diverse interests of the stockholders and of the respective acquisition candidates be determined. These terms include the purchase price and the exchange media-cash, debentures, preferred stock, or common stock.

The analysis is performed by test-running several combinations of prices and exchange packages, and by generating for each combination a consolidated income statement, balance sheet, and funds flow.

Once a few alternatives have been selected, the model is used again to produce a new output giving a before-and-after acquisition financial picture in terms of (i) EPS after preferred dividends; (ii) DPS received by a candidate stockholder; and (iii) value of stock held plus cash received by a candidate common stockholder (see Exhibit 5).

In developing a negotiation strategy, the staff must balance the change in the firm's EPS in relation to the dividends received and stock value held by a candidate stockholder.

Finally, before starting negotiations, the staff must calculate the total financing impact of the acquisition with one or two exchange combinations. The analysis places the candidate's capital structure under close scrutiny, and uses the model to simulate the consolidated financial performance six years into the future (see Exhibit 6).

EXHIBIT 5

SUPERIOR TREE ACQUIRING DELUXE HOMES IN 1969

EPS After Preferred Dividends on Superior Common Stock

MKT PREM	— PERCENT OF — CASH	PREF	COM	1969	1970	1971	1972	1973	1974
EPS BEFORE LAST ACQ				4.36	4.54	4.68	5.16	5.69	6.10
0.25	0.	0.	1.00	4.16	4.50	4.82	5.40	6.07	6.71
0.25	0.	0.50	0.50	4.14	4.53	4.90	5.58	6.33	7.07
0.25	0.20	0.	0.80	4.15	4.51	4.85	5.47	6.19	6.87
0.35	0.	0.	1.00	4.04	4.46	4.79	5.38	6.07	6.72
0.35	0.	0.50	0.50	3.99	4.48	4.87	5.58	6.36	7.14
0.35	0.20	0.	0.80	4.01	4.46	4.82	5.46	6.20	6.90

Amount of Dividends Received by a Deluxe Common Stockholder

MKT PREM	— PERCENT OF — CASH	PREF	COM	1969	1970	1971	1972	1973	1974
DPS BEFORE ACQUISITION				1.00	1.00	1.15	1.26	1.44	1.65
0.25	0.	0.	1.00	1.24	1.34	1.43	1.61	1.81	2.00
0.25	0.	0.50	0.50	1.87	1.92	1.98	2.08	0.94	1.05
0.25	0.20	0.	0.80	0.99	1.07	1.15	1.30	1.47	1.64
0.35	0.	0.	1.00	1.30	1.43	1.54	1.73	1.95	2.16
0.35	0.	0.50	0.50	1.99	2.07	2.13	2.25	1.02	1.15
0.35	0.20	0.	0.80	1.03	1.15	1.24	1.40	1.59	1.78

Value of Stock Held Plus Cash Received by a Deluxe Common Stockholder

MKT PREM	— PERCENT OF — CASH	PREF	COM	1969	1970	1971	1972	1973	1974
COM STOCK PRICE BEF ACQ				43.98	50.24	57.69	63.08	72.12	82.74
0.25	0.	0.	1.00	52.05	56.21	60.24	70.73	79.53	87.85
0.25	0.	0.50	0.50	50.86	54.02	58.43	69.73	41.42	46.30
	PLUS CASH OF			0.	0.	0.	0.	37.50	0.
0.25	0.20	0.	0.80	41.48	45.07	48.51	57.33	64.87	71.99
	PLUS CASH OF			10.00	0.	0.	0.	0.	0.
0.35	0.	0.	1.00	54.58	60.15	64.63	76.14	85.88	95.10
0.35	0.	0.50	0.50	53.91	57.75	62.74	75.35	44.97	50.49
	PLUS CASH OF			0.	0.	0.	0.	40.50	0.
0.35	0.20	0.	0.80	43.33	48.16	52.01	61.76	70.17	78.12
	PLUS CASH OF			10.80	0.	0.	0.	0.	0.

Table 8-5

(continued on page 188)

PAGES (S) MISSING FROM ORIGINAL

EXHIBIT 6

SUPERIOR TREE ACQUIRING DELUXE HOMES IN 1969

	1969	1970	1971	1972	1973	1974	
INCOME STATEMENT							
SALES	151.30	169.73	190.61	214.27	241.12	271.64	
PROFIT BEF INT + TAX	17.19	19.41	21.94	24.82	28.12	31.89	
INT ON DEBT + DEBNTUR	3.51	4.16	4.63	5.43	6.31	7.80	
DEPR OF WRITTEN-UP AST	0.	0.	0.	0.	0.	0.	
PROFIT AFT INT + TAX	6.84	7.62	8.65	9.70	10.90	12.04	
OTHER AFTER TAX INCOME	0.	0.	0.	0.	0.	0.	
GOODWILL AMORTIZATION	0.	0.	0.	0.	0.	0.	
PREFERRED DIVIDENDS	0.20	0.	0.	0.	0.	0.	
NUMB OF COM SH OUTSTNG	1.60	1.70	1.80	1.80	1.80	1.80	
EPS AFTER PFD DIV	**4.16**	**4.50**	**4.82**	**5.40**	**6.07**	**6.71**	8%
COM DIV/SHARE	2.08	2.25	2.41	2.70	3.04	3.35	
COM SH OVERHANG	0.20	0.10	0.	0.	0.	0.	
EPS AFT PFD + DEB CONV	3.88	4.32	4.82	5.40	6.07	6.71	
COM STOCK PRICE	87.44	94.43	101.21	118.82	133.61	147.60	
FUNDS FLOW							
RETAINED EARNINGS	3.32	3.81	4.33	4.85	5.45	6.02	
PLUS COM STK ISS/REPUR	0.	0.	0.	0.	0.	0.	
PLUS WRTN-UP AST DEPR	0.	0.	0.	0.	0.	0.	
PLUS GOODWILL AMORTIZ	0.	0.	0.	0.	0.	0.	
LESS INCR IN WRKNG CAP	3.26	3.69	4.17	4.73	5.37	6.10	
LESS INCR IN FIXED AST	8.64	9.47	10.41	11.48	12.70	21.19	
NET FUNDS FLOW	–8.58	–9.34	–10.25	–11.36	–12.62	–21.27	
BALANCE SHEET							
WORKING CAPITAL	30.26	33.95	38.12	42.85	48.22	54.33	
FIXED ASSETS	116.64	126.11	136.51	147.99	160.69	181.88	
WRITTEN-UP ASSETS	0.	0.	0.	0.	0.	0.	
GOODWILL	0.	0.	0.	0.	0.	0.	
DEBT	46.58	55.92	66.18	77.54	90.15	**111.43**	47%
DEBENTURES	5.00	5.00	0.	0.	0.	**0.**	
PREFERRED STOCK	5.00	0.	0.	0.	0.	**0.**	
COM STK + RET EARN	123.32	132.13	141.46	146.31	151.76	**157.78**	**53%**
SURPLS FROM ACQ	–33.00	–33.00	–33.00	–33.00	–33.00	**–33.00**	

SUPERIOR DEBENTURE ISSUE #1 CONVTD IN 1971
SUPERIOR PREFERRED ISSUE #1 CONVTD IN 1970

Table 8-6

Step 5: Negotiate with Candidate

During negotiations, the acquirer refines his assumptions about the future performance of the candidate and possible sets of exchange terms, and continually uses the model to update the overall acquisition picture.

. . . .

The McKinsey model is nothing other than an accounting simulation program, which can indeed serve a wide range of uses in any enterprise. When applied to acquisition analysis, the five steps to be taken are necessary and relevant if the acquisition candidates are publicly-owned corporations, from which financial data is readily available. For cases involving non-public acquisition candidates, however, Steps 3 and 4 might not be able to be taken before actually starting the negotiation process, i.e., Step 5. This fact may have the following consequences:

i. Additional chances for the acquistion not taking place.

ii. Additional costs for the whole acquisition program due to the lower rate of success which is likely to occur.

iii. Longer negotiations, which may result in

iv. Increased chances of an information leakage to the public concerning the possible merger.

These drawbacks, however, are circumstancial and unavoidable when the acquisition target is a privately-owned firm, of which little is publicly known. Therefore, these points do not constitute a weakness inherent to the program (this point holds for all the other programs which were designed primarily for public company acquisitions. Consequently, we shall not repeat this critique in subsequent program critiques.)

From a financial viewpoint, the major limitation of the program is posed by the framework adopted for analysis, i.e., an accounting framework. The program does not provide the means for performing discounted cash-flow analysis, probabilistic assessments of future outcomes or sensitivity analysis on the projected financial results of the combined entity. Furthermore, the program can only be run in one mode, namely, in that where the accounting data is supplied to the program and the program then produces the balance sheet, income and funds flow statements for the next six years. The inverse process, that is, where one supplies future objectives and the program determines the present conditions which must exist in order to attain the objectives, cannot be implemented. This means that the program can only be run on a trial-and-error basis, fact which in view of the large number of combinations which may have to be tried out, may result in high computer and staff-time costs. Clearly, though, whatever these costs may turn out to be, they will not only represent a considerable improvement over those which would accrue from manual analysis, but will also be much more justifiable in terms of the quality, quantity and breadth of their product.

2. The QUICKSCAN Program[2]

Developed by John D. Glover, David F. Hawkins and Andrew McCosh in early 1967, QUICKSCAN provides information on the immediate effects of a merger in which bonds and/or common stock are to be issued and in which dilution of earnings-per-share is of primary importance to the parent company management. The program was designed to screen a large number of potential acquisition candidates at an early stage of the acquisition search. By examining a large number of premium levels, the program provides the means of determining the sensitivity of the results to differences in premiums paid for the acquisition over the current market price of its stock. Through a built-in two-level screening system, QUICKSCAN is useful in performing a preliminary survey of transaction packages which are not feasible and for the identification of acquisition candidates which are unusually attractive. Depending on the version of the program, it may be run in two modes: one in which the transaction package is predetermined and the model outputs the resulting financial data, and one in which the maximum immediate short-term dilution is specified and the model determines the package which would produce that dilution. There exist a version which allows the two modes to be implemented simultaneously and results to be printed on a same output page. Table II is a printout of such a version of QUICKSCAN, where for each premium level

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[2] John D. Glover, David F. Hawkins and Andrew McCosh, "The Use of Computers in Merger Analysis," Mergers and Acquisitions, Summer 1967.

considered, three alternative exchange offers have been considered: (1) the mixes of stock and bonds leading to a zero dilution of earnings per share; (2) a straight exchange of common stock; and (3) an exchange offer which includes 70 percent stock and 30 percent bonds (issued at 6 percent).

The information required by QUICKSCAN and which was used to produce Table 8-7,is presented below along which the corresponding acronyms that we have used throughout our discussions. Appendix H includes the listing and sample output pages of our own version of QUICKSCAN.

Information Required from Acquiring Company

Acronym	Item	Number Used for Example
E1(Ø)	Current company dollar earnings estimate, this year ($M)	$49.4 M
P1	Current stock price, per share	$85.21
DPS(Ø)	Current dividend per share	$ 2.10
BIR	Interest rate on bonds to be issued, if any	6%
NOS1	Number of shares outstanding, now	9.22 M
D(Ø)	Current debt outstanding	$91 M

Information Required from Candidate Company

E2(Ø)	Current company dollar earnings (estimated or actual ($M)	$11.2 M
P2	Current stock price	$58.75
NOS2	Number of shares outstanding, now	3.56 M
D2(Ø)	Current debt outstanding	$26.0

Table 8-7

Sample Output Page from QUICKSCAN

NAME OF ACQUIRED COMPANY -- TRANSCONTINENTAL INC.

PREMERGER EPS -- PARENT 5.36
PREMERGER EPS -- ACQUIRED 3.15
PREMERGER PRICE -- PARENT 85.21

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	PURCH PREM PRCNT PAID	DIL UTE	BONDS PER CNT OF PRICE	BOND ISSUE (M)	TO BUY COMPANY MUST ISSUE		COMB INED INC-OME (M)	PER CNT GROUP OWN-ED	NEW EPS	ACQUIRED STCKHOLDRS GET PER OLD SHARE			COMPUTED STOCK PRICE AFTER MERGER		
LINE		PER CNT			NO. OF SHARES	VALUE (M)				EARN-INGS	NEW SHR	CSH FLO	OPT	MID	PESS
1	-5.0	.0	19.80	39.3	1870072	159.3	59.4	83.14	5.36	2.81	.53	1.77	95.93	85.21	74.49
2	-5.0	2.1	.00	.0	2331798	198.7	60.6	79.81	5.25	3.44	.65	1.38	93.92	83.43	72.94
3	-5.0	-1.1	30.00	59.6	1632259	139.1	58.8	84.96	5.42	2.48	.46	1.97	97.02	86.19	75.35
4	-.0	.0	28.37	59.3	1758092	149.8	58.8	83.99	5.36	2.65	.49	2.04	95.93	85.21	74.49
5	-.0	3.1	.00	.0	2454524	209.1	60.6	78.98	5.19	3.58	.69	1.45	92.93	82.55	72.17
6	-.0	-.2	30.00	62.7	1718167	146.4	58.7	84.29	5.37	2.59	.48	2.07	96.11	85.37	74.64
7	5.0	.0	36.13	79.3	1646112	140.3	58.2	84.85	5.36	2.48	.46	2.31	95.93	85.21	74.49
8	5.0	4.1	-.00	-.0	2577250	219.6	60.6	78.15	5.14	3.72	.72	1.52	91.97	81.69	71.42
9	5.0	.7	30.00	65.9	1804075	153.7	58.6	83.64	5.32	2.69	.51	2.17	95.21	84.57	73.94
10	10.0	5.0	1.07	2.5	2671190	227.6	60.5	77.54	5.09	3.82	.75	1.62	91.13	80.95	70.77
11	10.0	5.1	-.00	-.0	2699976	230.1	60.6	77.35	5.08	3.86	.76	1.59	91.02	80.85	70.68
12	10.0	1.7	30.00	69.0	1889984	161.0	58.5	82.99	5.27	2.80	.53	2.28	94.32	83.78	73.25
13	15.0	5.0	9.75	23.5	2547370	217.1	59.9	78.35	5.09	3.64	.72	1.90	91.13	80.95	70.77
14	15.0	6.1	-.00	-.0	2822703	240.5	60.6	76.56	5.03	3.99	.79	1.67	90.09	80.03	69.96
15	15.0	2.6	30.00	72.2	1975892	168.4	58.4	82.35	5.22	2.90	.56	2.38	93.45	83.01	72.57
16	20.0	5.0	17.72	44.5	2473550	206.5	59.3	79.19	5.09	3.47	.68	2.18	91.13	80.95	70.77
17	20.0	7.0	-.00	-.0	2945420	251.0	60.6	75.79	4.98	4.12	.83	1.74	89.18	79.22	69.26
18	20.0	3.5	30.00	75.3	2061800	175.7	58.3	81.72	5.17	2.99	.58	2.49	92.58	82.24	71.90

The QUICKSCAN program constitutes a useful tool to determine the immediate impact of an acquisition on earnings-per-share. However, granted the fact that immediate EPS results were viewed as the main criteria of attractiveness for a merger at the time the program was created, we have already seen that it is by no means the only one that affects a stock's price. To this extent, therefore, we find QUICKSCAN very limited as a screening tool. Insofar, however, as the current debt levels of the acquiring and candidate firms must be entered into the program, its scope and validity as a merger screening tool can be increased at no extra cost by calculating and using the debt-to-equity ratio as a criteria for candidate selection. In its present form, QUICKSCAN is nothing else than a useful EPS computational tool.

As most of the merger analysis computer programs, QUICKSCAN assumes that the acquisition candidate is a public firm. This, however, does not constitute a liability if the purchase concerns a private firm. In such a case, the acquirer will input into the program the pertinent values as they are being considered through the course of negotiations.

3. MERGERESTIMATOR[3]

Developed by the same team which designed QUICKSCAN, MERGERESTIMATOR subjects to more detailed analysis the best acquisition candidates, as selected by QUICKSCAN.

[2] Idem.

In twenty-nine pages of analysis, it provides answers to a high proportion of the questions management is likely to ask with regard to the financial aspects of possible acquisition arrangements with each company examined. The program compares the present with projected situations in the future by using historic trends (perhaps modified by management's projected estimated of future developments) to project financial results five years out on a pro-forma basis. Such projections, although subject to varying degrees of uncertainty, provide a basis for analyzing and discussing future possibilities of the acquisition program.

Three basic types of merger-exchange packages are considered by the MERGERESTIMATOR program: (i) common stock only; (ii) common stock plus bonds, which may or may not include convertible features; and (iii) common stock plus preferred stock, which may or may not be convertible. In the case of convertible bonds and convertible preferred shares, it is necessary not only to specify the bond interest rate and the preference dividend rate, but also a conversion price or ratio on each $100 principal amount of the particular security. Although the program is designed so that any conversion rate might be specified by the analyst, it has the default capability of looking automatically at several alternative assumptions.

MERGERESTIMATOR requires the same information as QUICK-SCAN, plus the items listed below.

Information Required on the Acquiring Company

Acronym	Item	Number used in Exhibits
S1(∅)	Current sales estimate, this year ($M)	$626.0 M
PAYOUT(t)	Assumed future dividend payout ratio	40%
BCR	Conversion rate, common per $100 bonds	1.0 com.
CPCR	Conversion rate, common per $100 convertible preferred	1.0 com.
CPD	Preferred dividend rate	7%
EPS1(t)	Future EPS estimates, next four years	$ 6.50 $ 7.00 $ 7.30 $ 7.50
NOS1(4)	Assumed number of shares outstanding five years out	10.0 M
E1(t)	Dollar earnings for each of the last five years	$ 37.00 to $ 46.00 M
S1(t)	Sales for each of the last five years	$500.00 to $627.00 M

Information Required on Candidate Company

S2(∅)	Current sales (estimated or actual)	$ 99.6 M
S2(t)	Sales for each of the last five years	$ 70.0 $ 79.2 $ 76.6 $ 81.2 $ 87.3 M
E2(t)	Earnings for each of the last five years	$ 7.4 $ 8.2 $ 8.9 $ 9.4 $ 10.1 M
BV2	Book value of assets	$144.0 M

The output from MERGERESTIMATOR falls in three broad classes: overall summary of preselected key data; merger results by premium groups; and merger results by exchange-package type.

The first class of output (see Table 8-8) is an overall comparative summary of selected data for each of the potential candidates. All results are prepared on the basis of management's estimates of "most probable" estimates of data.

The two remaining classes of output from MERGERESTIMATOR are designed to make it possible for the analyst to examine in-depth the financial possibilities and implications of possible merger with one or more of the companies listed in the comparative results printouts.

Table 8-9 presents selected financial consequences that would result from each of several packages given to the acquired stockholders under each of several assumptions as to what premium over, or discount from, market value might be sufficiently attractive to both companies to make the acquisition possible.

This second class of output can be produced for any number of earnings estimates the management might choose to assume for purposes of analysis.

The third class of output (see Table 8-10) from MERGERESTIMATOR is less frequently used than the first two. This class of

Table 8-8

Sample Output of MERGERESTIMATOR

SUMMARY OF OUTPUT - ALL COMPANIES

	SUBSIDIARY NAMES	ROUTES	------PACKAGE------			-------CURRENT RESULTS----				-RESULTS AFTER FIVE YEARS-----				
			COMM. SHARES VALUE ($M)	CONV. PREF. VALUE ($M)	BONDS VALUE ($M)	PER CENT OWN -ED	NEW EPS	CASH FLOW TO B SHRS	STOCK PRICE	PER CENT OWN -ED	NEW EPS	CASH FLOW TO B SHRS	STOCK PRICE	SALES (PROFIT PRCNT)
			1	2	3	4	5	6	7	8	9	10	11	12
1	TRANSCONTINENTAL INC	COMMON	230.06	.00	.00	77.35	5.08	1.59	83.46	78.74	6.84	2.07	121.15	
2		BONDS	161.05	.00	69.02	82.99	5.27	2.28	86.48	79.06	6.87	2.04	121.63	885.8
3		CON.PREF	115.03	115.03	.00	87.23	4.97	3.06	81.61	79.27	6.89	2.02	121.96	(9.8)
4	LONGWORTH CORPORATION	COMMON	313.08	.00	.00	71.50	4.57	7.72	83.00	73.13	6.55	9.62	127.70	
5		BONDS	219.16	.00	93.92	78.19	4.76	11.04	86.42	73.50	6.58	9.49	128.35	985.8
6		CON.PREF	156.54	156.54	.00	83.39	4.34	14.82	78.79	73.75	6.60	9.40	128.78	(9.1)
7	NATIONAL TRUCKS COMPANY	COMMON	784.14	.00	.00	50.05	5.04	2.68	81.34	52.08	6.49	3.31	110.15	
8		BONDS	548.90	.00	235.24	58.87	5.48	3.83	88.41	52.55	6.55	3.28	111.15	1454.1
9		CON.PREF	392.07	392.07	.00	60.71	4.74	5.15	76.39	52.87	6.59	3.26	111.83	(8.6)
10	PLANTERS GROVE INC	COMMON	493.21	.00	.00	61.43	4.48	1.43	82.22	63.34	6.29	1.71	122.71	
11		BONDS	345.25	.00	147.96	69.47	4.74	2.05	86.85	63.78	6.34	1.69	123.56	991.8
12		CON.PREF	246.61	246.61	.00	76.11	4.13	2.75	75.74	64.07	6.36	1.68	124.13	(10.0)
13	PEABODY CARS INC	COMMON	361.16	.00	.00	68.51	7.16	1.24	82.77	70.23	8.27	1.96	102.47	
14		BONDS	252.81	.00	108.35	75.65	7.64	1.78	88.32	70.63	8.32	1.94	103.05	1774.4
15		CON.PREF	180.58	180.58	.00	81.31	7.38	2.39	85.34	70.89	8.35	1.92	103.44	(6.6)

Table 8-9

Sample Output of MERGERESTIMATOR

PREMIUM SUMMARY SHEET - PREMIUM PERCENT = 10

TRANSCONTINENTAL INC

EPS OF PARENT ALONE AFTER FIVE YEARS ASSUMED TO BE $ 7.00

	------PACKAGE-----			----CURRENT RESULTS-----				-RESULTS AFTER FIVE YRS-			
	COMM. SHARES VALUE ($M)	CONV. PREF. VALUE ($M)	BONDS VALUE ($M)	PER CENT OWN -ED	NEW EPS	CASH FLOW TO B SHRS	STOCK PRICE	PER CENT OWN -ED	NEW EPS	CASH FLOW TO B SHRS	STOCK PRICE
	1	2	3	4	5	6	7	8	9	10	11
1 COMMON STOCK ONLY	230.06	.00	.00	77.35	5.08	1.59	83.46	78.74	6.60	2.00	116.96
2 30 PERCENT BONDS PLUS COMMON-NO CON	161.05	.00	69.02	82.99	5.27	2.28	86.48	84.10	6.88	2.62	121.85
3 30/100 BONDS + COMMON - HALF CONV.	161.05	.00	69.02	82.99	5.27	2.28	86.48	81.50	6.75	2.30	119.57
4 30/100 BONDS + COMMON - ALL CONVERT	161.05	.00	69.02	82.99	5.27	2.28	86.48	79.06	6.63	1.97	117.43
5 25/100 CON.PREF 0/100 CONVTD	172.55	57.52	.00	81.99	5.03	2.33	82.59	83.16	6.64	2.64	117.60
6 25/100 CON.PREF 50/100 CONVTD	172.55	57.52	.00	81.99	5.03	2.33	82.59	81.22	6.65	2.29	117.75
7 25/100 CON.PREF 100/100 CONVTD	172.55	57.52	.00	81.99	5.03	2.33	82.59	79.36	6.66	1.94	117.89
8 50/100 CON.PREF 0/100 CONVTD	115.03	115.03	.00	87.23	4.97	3.06	81.61	88.11	6.68	3.28	118.31
9 50/100 CON.PREF 50/100 CONVTD	115.03	115.03	.00	87.23	4.97	3.06	81.61	83.86	6.69	2.58	118.58
10 50/100 CON.PREF 100/100 CONVTD	115.03	115.03	.00	87.23	4.97	3.06	81.61	80.00	6.71	1.88	118.83
11 100/100 CON.PREF 0/100 CONVTD	.00	230.06	.00	100.00	4.83	4.52	79.22	100.00	6.78	4.52	120.02
12 100/100 CON.PREF 50/100 CONVTD	.00	230.06	.00	100.00	4.83	4.52	79.22	89.68	6.80	3.14	120.43
13 100/100 CON.PREF 100/100 CONVTD	.00	230.06	.00	100.00	4.83	4.52	79.22	81.30	6.82	1.76	120.76

information involves the collation of several series of data related to each of several acquisition packages, taken one at a time. These Table 8-10-type printouts present, for each package to be considered. several different results under each of a number of assumed possible variations in the future earnings of the acquirer and for each of several different levels of possible premiums. Data derived from taking into account synergistic effects projected to occur by management are given in the last three lines of Table 8-10.

The MERGERESTIMATOR program is indeed a very useful program. The last three lines of Table 8-10, for instance, provide a good example of the extent to which the program provides answers to the particular needs and objectives of the user.

Its major weakness, as far as we can tell from the description given by the authors, is, like in the case of QUICKSCAN, to overlook some of the other important measures of attractiveness used in acquisition analysis. The program focuses strongly on the factors that affect operating or business risk, but does not take the factors that affect the financial risk of a concern into consideration.

Similar to the McKinsey[4] program, MERGERESTIMATOR's framework for analysis is entirely based on accounting procedures. The program does not make use of the analytical techniques described in the previous chapters, i.e., discounted cash flow analysis, probab-

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[4]Op. cit.

Table 8-10

Sample Output of MERGERESTIMATOR

ACQUISITION FOR COMMON STOCK ONLY	1	2	3	4	5	6	7	8	9	10	11	12
										TRANSCONTINENTAL INC		
EPS PARENT ALONE AFTER FIVE YEARS	-----	6.50-------		-----	7.00--------		-----	7.30---------		------	7.50---------	
PREMIUM PERCENTAGE ASSUMED	0	10	20	0	10	20	0	10	20	0	10	20
ROUTE NUMBERS	301	302	303	304	305	306	307	308	309	310	311	312
1 TOTAL EARNINGS JUST AFTER MERGER (M)	60.60	60.60	60.60	60.60	60.60	60.60	60.60	60.60	60.60	60.60	60.60	60.60
2 EPS JUST AFTER MERGER	5.19	5.08	4.98	5.19	5.08	4.98	5.19	5.08	4.98	5.19	5.08	4.98
3 DILUTION JUST AFTER MERGER	3.12	5.11	7.03	3.12	5.11	7.03	3.12	5.11	7.03	3.12	5.11	7.03
4 TOTAL EARNINGS AFTER FIVE YEARS (M)	78.86	78.86	78.86	83.86	83.86	83.86	86.86	86.86	86.86	88.86	88.86	88.86
5 EPS AFTER FIVE YEARS	6.33	6.21	6.09	6.73	6.60	6.48	6.97	6.84	6.71	7.14	7.00	6.86
6 DILUTION AFTER FIVE YEARS	2.58	4.46	6.28	3.80	5.66	7.45	4.46	6.30	8.08	4.87	6.70	8.47
7 PERCENT OWNED JUST AFTER MERGER	78.98	77.35	75.79	78.98	77.35	75.79	78.98	77.35	75.79	78.98	77.35	75.79
8 PERCENT OWNED AFTER FIVE YEARS	80.29	78.74	77.25	80.29	78.74	77.25	80.29	78.74	77.25	80.29	78.74	77.25
9 STOCK PRICE AFTER FIVE YEARS	112.16	109.99	107.90	119.27	116.96	114.74	123.53	121.15	118.85	126.38	123.94	121.59
10 NUMBER OF COMMON ISSUED (M)	2.45	2.70	2.95	2.45	2.70	2.95	2.45	2.70	2.95	2.45	2.70	2.95
11 VALUE OF COMMON SHARES ISSUED (M)	209.15	230.06	250.98	209.15	230.06	250.98	209.15	230.06	250.98	209.15	230.06	250.98
12 CASH FLOW (INT+ DIV) PER B SHARE	1.45	1.59	1.74	1.45	1.59	1.74	1.45	1.59	1.74	1.45	1.59	1.74
13 CASH FLOW PER B SHARE AFTER FIVE	1.75	1.88	2.02	1.86	2.00	2.14	1.92	2.07	2.22	1.97	2.12	2.27
14 VALUE OF BONDS TO BE ISSUED	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
15 NUMBER OF CONVERT. PREF ISSUED (M)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16 PARENT COMMON ISSUED PER B SHARE	.69	.76	.83	.69	.76	.83	.69	.76	.83	.69	.76	.83
17 EARNINGS ACCRUING PER B AFTER 5 YRS	4.37	4.71	5.04	4.64	5.01	5.36	4.81	5.19	5.55	4.92	5.31	5.68
18 NO.OF COMMON ISSUED (INCL CONV) 5 YR	2.45	2.70	2.95	2.45	2.70	2.95	2.45	2.70	2.95	2.45	2.70	2.95
19 VALUE OF COMMON(+CONV.)ISSUED,5 YR	275.30	297.00	317.80	292.70	315.80	338.00	303.20	327.10	350.10	310.20	334.60	358.10
20 TOTAL ACQUISITION PRICE (M)	209.15	230.06	250.98	209.15	230.06	250.98	209.15	230.06	250.98	209.15	230.06	250.98
21 IMPROVED EPS AFTER 5 YEARS	6.82	6.68	6.56	7.24	7.10	6.96	7.49	7.35	7.21	7.66	7.51	7.37
22 IMPROVED CASH FLOW PER B AFTER FIVE	1.88	2.03	2.17	2.00	2.15	2.30	2.07	2.23	2.38	2.11	2.28	2.44
23 IMPROVED DILUTION AFTER FIVE YEARS	-4.86	-2.83	-.88	-3.39	-1.39	.53	-2.61	-.62	1.28	-2.12	-.14	1.75

ilistic treatment of future events, etc. Furthermore, the program does not possess built-in capabilities for performing sensitivity analysis on future preformance. To do so, the user must rerun the model over and over gain, using as inputs different combinations of possible outcomes.

MERGERESTIMATOR compares favorably relative to the McKinsey program in that:

i. It allows the user to specify the maximum allowable short-term EPS dilution and then computes the package which reaches that limit.

ii. It provides the user with more types of possible output formats.

iii. It may be used to structure packages which contain convertible securities.

The programs seen thus far are intended to be used in a batch-environment. In what follows, we describe the ones which can be used in a time-sharing mode. The reader is referred to the first section of Chapter IX for a brief note on time-sharing.

4. The REALSCAN Program[5]

REALSCAN represents the time-shared equivalent of MERGER-ESTIMATOR, described in the preceding section.

The initial part of the program requires that data related to both parent and candidate company be fed to the computer. These data are the base from which subsequent calculations are made. The initial entry of these data, however, is not a firm commitment for the entire analysis. The manager is given several opportunities during his analysis to adjust or completely change the base on which subsequent calculations are made.

Once the initial data for the parent and candidate are entered, REALSCAN allows the manager with acquisition responsibilities to investigate one or more of the following basic merger routes:

1. Common stock only.
2. Common stock and convertible bonds.
3. Common stock and convertible preferred stock.

The two additional pieces of information that can be provided by REALSCAN are:

1. Mix of common stock and bonds to achieve specific earnings dilution results.

---

[5] David F. Hawkins, Andrew M. McCosh, and James C. Lampe, "Time-Shared Merger Analysis", Mergers and Acquisitions, Jan-Feb. 1969, Volume 4, No. 1

2. Convertible preferred dividend rate required to equal the old dividend yield on the acquired company's stock.

Under each of these alternatives, the user is allowed to control such variables as earnings, premium to be paid, percentage mix of package to be offered, expected conversion of bonds or preferred stock oustanding, dilution of earnings, and effective dividend rate desired.

The additional possibility of selecting a desired output is available. Any combination of the following print alternatives can be selected:

1. Total package needed to be offered.
2. Package needed to be offered per candidate share.
3. Combined earnings.
4. Combined EPS.
5. Percentage dilution of earnings.
6. Percentage of ownership.
7. Market price per share of common stock.
8. Cash-flow per old share of acquired company.
9. Earnings per old share of acquired company.
10. Number of common shares outstanding.
11. Value of common shares outstanding.

As mentioned, REALSCAN is nothing else than the time-sharing version of MERGERESTIMATOR. As such, it has the same inherent strengths and weaknesses. Clearly, however, the fact it may be used in the interactive mode renders it a much more practical acquisition analysis tool than its batch counterpart.

The following table shows a sample session using REALSCAN.

Table 8-11

*********** SAMPLE SESSION USING REALSCAN ***********

```
 PARENT DATA
9.22,85.25,3.0,2.10,7.0,0.0

 SALES HISTORY
657.1,604.1,562.0,504.1,471.2

 EARNINGS HISTORY
46.4,42.0,39.0,39.3,37.0


 PROJECTIONS            5          10        the computer calculates trend lines based on
 SALES             971.87     1373.35        the data submitted above and projects data
 EARNINGS           80.97      142.61        five and ten years forward.

 OTHER SHARES ISSUED--5 & 10 years
.5,1.0

 YOUR ESTIMATES - SALES
971.87,1373.35

 YOUR ESTIMATES - EARNINGS
80.97,142.61

 CHOOSE PRINT                                numbers entered are codes for results which
2,3,4,5,6,8                                  shall be printed later.

 CANDIDATE DATA
.95,254.62,2.0

 SALES HISTORY
95.6,69.2,41.1,28.6,2.0
```

Table 8-11 (Cont.)

```
 EARNINGS HISTORY
6.9,3.7,1.3,0.2,0.1

 PROJECTIONS            5          10
 SALES             257.79      474.83
 EARNINGS           39.59       99.03

 YOUR ESTIMATES - SALES
250.0,400.0

 YOUR ESTIMATES - EARNINGS
35.0,50.0

 SELECT ROUTE                  the user is given the option of celecting
2                              the securities to be used in package.
                               common stock and convertible bond is chosen.

 PREMIUM
20.0                           twenty percent premium is offered.

 BOND PERCENT
40.0                           forty percent of total package to be bonds.

 CONVERSION
0.0,0.0,1.0                    no bonds will be converted within 5 - 10 yrs.
```

Table 8-11 (Cont.)

PER CAND. SHARE

	VALUE	NUMBER
COMM	183.33	2.25
BOND	122.22	.12
TOTL	305.54	

RESULTS

	1	5	10
EARN	60.95	114.66	191.30
EPSB	5.37	9.71	15.56
DILU	2.55	-10.58	1.87
OWND	81.86	81.86	81.86
CF/B	8.49	12.38	17.63

NOW WHAT
2

the user is given the option of choosing what to do next. user decides to look at the company under the common and convertible route again.

ROUTE
2

PREMIUM
20.0

BOND PERCENT
30.0

bond percentage is changed to 30%.

CONVERSION
0.0,0.0,1.0

Table 8-11 (Cont.)

```
 PER CAND. SHARE
            VALUE    NUMBER
 COMM      213.88     2.51
 BOND       91.66      .09
 TOTL      305.54
RESULTS
              1        5       1010
 EARN       60.95   114.66   191030
 EPSB        5.25     9.47    15.18
 DILU        4.92    -7.88     1.96
 OWND       79.46    79.46    79.46
 CF/B        8.25    12.67    18.64

 NOW WHAT
2

 SELECT ROUTE
4

 PREMIUM
20.0

 DILUTION
5.

 CONVERSION
0.0,0.0,1.0
```

user specifies he wishes to determine package which will produce an immediate eps dilution of 5%.

Table 8-11 (Cont.)

```
 PER CAND. SHARE
           VALUE    NUMBER
 COMM     215.03     2.52
 BOND      90.51      .09
 TOTL     305.54
RESULTS
             1        5        10
 EARN      60.97   114.68   191.32
 EPSB       5.25     9.46    15.16
 DILU       5.00    -7.78     1.96
 OWND      79.37    79.37    79.37
 CF/B       8.24    12.68    18.68

NOW WHAT
3

 PACKAGE
           VALUE    NUMBER
 COMM     204.28     2.40
 BOND      85.99      .09
 TOTL     290.27

 PER CAND. SHARE
           VALUE    NUMBER
 COMM     215.03     2.52
 BOND      90.51      .09
 TOTL     305.54
RESULTS
```

user specifies he desires a print-out of all the information pertinent to the above package.

Table 8-11 (Cont.)

	1	5	10
EARN	60.97	114.68	191.32
EPSB	5.25	9.46	15.16
DILU	5.00	-7.78	1.96
OWND	79.37	79.37	79.37
PRIC	88.91	160.33	256.88
CF/B	8.24	12.68	18.68
EPSB	13.94	23.87	38.25
#COM	11.62	12.12	12.62
CAPL	1032.82	1942.66	3240.02

```
 NOW WHAT
5                                    user specifies he wishes to terminate session

*STOP*

TIME USED
CPU: 0.15 MIN
CON: 0.30 HOURS
IHC002I STOP    0  ***** RESTART AT LOCATION  1024D0
EXECUTION TERMINATED
```

5. The PROSIM Program[6]

PROSIM was developed to answer the question: How much is the company to be acquired worth? Written at Harvard Business School for use on a computer time-sharing system, the program is intended to be primarily an educational tool which simulates the future performance of the acquisition candidate and produces a probability distribution of its value under various assumptions which the user can control. More specifically, PROSIM performs Monte Carlo simulations to: (i) derive pro-forma cash flows five years out and (ii) calculate a terminal value (an analytical proxy for cash flows beyond the fifth year) which can be based on either fifth year earnings or fifth year cash flows. The program then calculates the present value of the cash flows and of the terminal value to derive the probability distribution (risk profile) for the value of the selling firm.

Because the program proceeds by having a dialogue with the user, all the user needs to do is to answer the questions posed by the program. However, in order to avoid having to specify all the input values in the interactive mode, it is possible to make the base data part of the program. Later, however, this data can be modified by retyping a line containing the new data. While the program is running, it is still possible to modify the discount rate or terminal value.

---

[5] "Computer Programs for the Analysis of the Providence Furniture Manufacturing Company Acquisition", Harvard Business School Case 9-173-036, 1972

The probability distributions require five points from the cumulative distribution. These points are entered in ascending order with each value of the variable followed by its cumulative probability as illustrated:

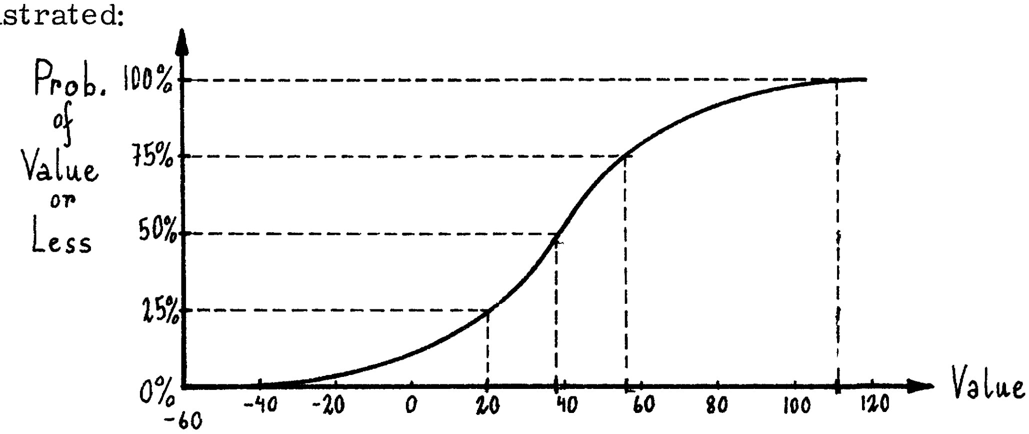

Figure 8-1

The distribution required by PROSIM to begin simulating the operations of the candidate firm are listed below:

Acronym	Item
CGS	Cost of good sold during first year.
GSA	General selling and administrative expenses.
WC	Working capital
G2(1)	First year growth rate
G2(2)	Second year growth rate
G2(3)	Third year growth rate
G2(4)	Fourth year growth rate
G2(5)	Fifth year growth rate

The following figures also need to be specified:

DPR	Five year annual depreciation
DR	Discount rate
PE	Price-earnings ratio
FSB	Fraction of shares bought initially

Two types of outputs are available from the PROSIM program:

1. A five-year pro-forma statement of selected financial quantities. The results are the resultant averages from 200 trials (see Figure 1).

2. Probability distributions (risk profiles) of selected variables. Figure 2 illustrates some sample output and is based on the same data as Figure 1, with the additional assumption of a 15 percent discount rate and an initial purchase of 80 percent of the candidate's common stock. For each variable, the expected value or mean, standard deviation and standard error estimate are calculated.

To the extent that PROSIM's main purpose is to teach managers to asses the future in probabilistic terms, the program simulates the future operations of the selling firm by basing most of its results for a given year on the value of sales for that year. Furthermore, the following simple logic is embodied in the program:

1. All probability distributions for any one year are independent of the previous results, and of the outcome of other quantities in the same year.

2. The Present Value (PV) of the acquisition equals:

$$PV = PV\ (\text{dividends}) - PV\ (\text{outstanding loans}) + PV\ (\text{loan interest and repayments}) + PV\ (\text{terminal value})$$

3. Sales in any year is the product of the preceding year's sales and the present year's growth rate.

4. Depreciation is straight line at $50,000 per year.

5. The net value of equipment is kept constant by investing every year an amount equal to depreciation in new equipment.

6. If cash flow is negative, the acquirer supplies financing at 6 1/2 interest.

7. If cash flow is positive, the priorities are: (i) repay any loan from the acquirer, and (ii) if funds remain, pay dividends.

Exhibit 1 shows the result of a typical session using PROSIM. The critique on PROSIM has been deferred until PRODEP is described.

Conversation with PROSIM Program*

```
195 DATA .15,15,.6667
RUN

 PRØVIDENCE FURNITURE MØDEL

BASED ØN 200 TRIALS
WANT A 5 YR PRØ-FØRMA (1=YES,0=NØ)?1

VALUES IN $000
 1972            1973            1974            1975            1976
SALES
 4719.3          5264.8          5886.5          6444.2          6848.4

CGS
 3484.4          3881.7          4341            4766.1          5030.2

GSA
 834.6           930.2           1026.6          1136.2          1234.5

PBT
 350.3           402.9           468.9           491.8           533.7

PAT
 173.2           198.4           230.3           241.2           261.3

ADD W.C.
-2.657           73.142          102             111.9           54.294

CASH FLØW
 175.9           125.2           128.2           129.2           207

DIVIDENDS TØ DRA
 92.585          90.026          85.254          81.646          113.6

LØAN FRØM DRA
 9.974           35.283          36.382          40.523          32.115

LØAN REPAYMENT
 0               7.652           26.476          34.978          40.981

PRØB ØF DIVIDEND PAYMENT
 0.865           0.74            0.67            0.67            0.745

ØUTSTANDING LØAN
 9.974           37.606          47.511          53.056          44.191

WANT JUST NPV (0), ØR ALL 6 PRØFILES (1)?0

                 NPV

   MEAN        2249.7
  STD DEV      1196.9
STD ERR EST      84.6
   0 %TILE     -611.2
  25 %TILE     1519.6
  50 %TILE     2384.0
  75 %TILE     3196.4
 100 %TILE     5414.8
```

*User responses are underlined:the data supplied to the program is the same as in Figures 1 and 2 with the assumption that DRA buy 2/3 of the Providence stock initially.

```
TERMINAL VALUE CALCULATIØN IS
BASED ØN 15 TIMES YR 5 EARNINGS

WANT MØRE (1=YES,0=NØ)?1
WHICH ØPTIØN DØ YØU WANT?
NØNE  (0)
CHANGE DISCØUNT RATE  (1)
CHANGE P/E MULTIPLE   (2)
CHANGE CASH FLØW MULTIPLIER  (3)
CALCULATE TERMINAL VALUE
BY P/E MULTIPLIER      (4)
ØR BY CASH FLØW        (5)
?3
CURRENT CASH FLØW MULTIPLIER IS 6.66667 WHAT IS NEW VALUE?20
ØPTIØN NØ.?5
TERMINAL VALUE IS NØW 20 TIMES YR 5 CASH FLØW
ØPTIØN NØ.?0

WANT A 5 YR PRØ-FØRMA (1=YES,0=NØ)?0
WANT JUST NPV (0), ØR ALL 6 PRØFILES (1)?1
ØNLY RISK PRØFILE SUMMARY (0), ØR PERCENTILES TØØ (1)?0
```

	NPV	TERMINAL VALUE *	TERM VAL DISCØUNTED	YR 5 PAT	AV YR4 YR5 PAT	YR 5 SALES
MEAN	2189.3	3829.0	1903.7	259.6	243.0	6844.3
STD DEV	2511.5	4901.7	2437.0	153.7	118.4	452.3
STD ERR EST	177.6	346.6	172.3	10.9	8.4	32.0

```
* BASED ØN 20 TIMES YR 5 CASH FLØW

WANT MØRE (1=YES,0=NØ)?1
WHICH ØPTIØN DØ YØU WANT?
?2
CURRENT VALUE ØF P/E MULTIPLE IS 15 WHAT IS NEW VALUE?20
ØPTIØN NØ.?4
TERMINAL VALUE IS NØW 20 TIMES YR 5 EARNINGS
ØPTIØN NØ.?0

WANT A 5 YR PRØ-FØRMA (1=YES,0=NØ)?0
WANT JUST NPV (0), ØR ALL 6 PRØFILES (1)?1
ØNLY RISK PRØFILE SUMMARY (0), ØR PERCENTILES TØØ (1)?1
```

	NPV	TERMINAL VALUE *	TERM VAL DISCØUNTED	YR 5 PAT	AV YR4 YR5 PAT	YR 5 SALES
MEAN	2922.2	5311.0	2640.5	265.5	244.4	6795.1
STD DEV	1540.4	3004.7	1493.8	150.2	100.2	410.3
STD ERR EST	108.9	212.5	105.6	10.6	7.1	29.0
0 %TILE	-2124.0	-4590.5	-2282.3	-229.5	-21.7	5898.4
25 %TILE	1881.5	3210.8	1596.3	160.5	177.6	6481.1
50 %TILE	3082.6	5564.6	2766.6	278.2	255.3	6773.7
75 %TILE	3927.3	7328.8	3643.7	366.4	314.7	7041.9
100 %TILE	7283.7	13701.9	6812.3	685.1	490.2	7766.1

```
* BASED ØN 20 TIMES YR 5 EARNINGS

WANT MØRE (1=YES,0=NØ)?0
```

(Continued on p. 221)

PAGES (S) MISSING FROM ORIGINAL

PAGES (S) MISSING FROM ORIGINAL

PAGES (S) MISSING FROM ORIGINAL

6. The PRODEP Program[8]

PRODEP (Pro Deal Evaluation Program) is an interactive computer program which uses the output of PROSIM and performs an analysis of the possible cost in present value terms to the acquirer or the various financial packages which might be offered to the acquisition candidate. The program assumes the case of a contingent payment, i.e., that the package will consist of an initial cash payment followed by a payment at the end of five years based on a multiple of some interimperformance measure. The program automatically considers fifth year earnings, the average of fourth and fifth year earnings and fifth year sales as possible measures. The output of the program is designed to answer two questions:

1. If the acquisition has a mean present value of \$X, and if \$Y is paid initially (i.e., NPV = \$Y + \$X), what multiple of each performance measure is implied for the payment to be made at the end of five years, in terms of

   a. All of the acquisition's outstanding shares.

   b. The shares of the acquirer will buy in the fifth year.

2. If \$Y immediate cash if offered now, and the payment to be made in the fifth year is set to be equal to a predetermined

---

[8] Idem.

multiple of the performance measures, what is the probability distribution (along with its mean) of:

a. That payment undiscounted.

b. That payment discounted.

c. The total package discounted

For illustration purposes, assume that the payment to be made during the fifth year is made contingent upon the amount of earnings for that year, and that the acquisition has a mean present value of $2,000,000 of which $1,000,000 is paid now in cash.

If it is determined that the expected value of fifth year earnings is $191,200 (not discounted), the program determines the multiple by which this figure when multipled has a present value of $1,000,000 (i.e., what payment will yield NPV = 0?). This is determined as follows:

$$\text{Future value of } \$1,000,000 = \$1 \times (1.15)^{15} = \$2.01 \text{ Million}$$

$$\text{Multiple} = \frac{\text{Future value of } \$1,000,000}{\text{Mean earnings fifth year}} = \frac{\$2.01}{\$.1912} = 10.52 \text{ X}$$

The cumulative distribution fractiles of the fifth year earnings distribution are then multiplied by 10.52 to obtain the distribution of the contingent payment. The values of this distribution are then discounted into the present and added to the initial $1,000,000 cash payment to obtain the probability distribution of the whole package.

The obtained multiple (10.52) represents the multiple which, if attached to fifth year earnings, yields an expected net present value of zero for the acquisition. This means that, based on the probability distributions specified for PROSIM, if a higher (lower) multiple is affixed to fifth year earnings in determining the contingent payment to be made in that year, the acquirer will pay an amount which on a present value basis yields a NPV for the acquisition lower (higher) than zero. Therefore, 10.52 represents the highest P/E multiple that the acquirer should affix to fifth year earnings in determining the value of the contingent payment.

In order to use PRODEP, it is necessary to run PROSIM so as to obtain the distributions for the three performance variables to be used in determining the value of contingent payment.

Once the program is running, the discount rate, the amount of initial payment, and the percentage of stock that this initial payment will buy (i.e., the price at which the stock will be bought) can be varied.

Other measures of performance, besides fifth year earnings, the average of fourth and fifth year earnings, and fifth year sales, can be used.

The program's logic is extremely simple: it simply performs a rescaling of probability distributions of performance measures based on multipliers and discount factors. It presumes that if the performance measure on which the fifth year payment is based, is negative, no payment will take place by either party.

Exhibit 2 shows the result of a typical run using PRODEP.

The PROSIM and PRODEP programs deal with risk in a systematic and formal manner. Both programs have been developed for educational purposes (they have both been specially tailored for use in classroom sessions at Harvard Business School), and accordingly, are easy to get acquainted with and to use. The concept of risk and its importance in acquisition analysis are clearly demonstrated. The educational strong points of PROSIM and PRODEP have been obtained, however, at the inevitable expense of rigidity and simplicity of logic, facts which may become serious liabilities in real-world applications (e.g., single and constant discount rate to compute PV, independence of cash flows from period to period, single lending interest rate, automatic lending by the acquirer in case of negative cash flows). Nevertheless, the approach used can easily be incorporated into acquisition simulation programs of the MERGERESTIMATOR-type. The next program to be described constitutes an effort in that direction.

Conversation with PRODEP Program*

```
    DEAL EVALUATIØN PRØGRAM FØR
    PRØVIDENCE FURNITURE ACQUISITIØN

CURRENT DISCØUNT RATE IS 15 %, WANT TØ CHANGE IT (1=YES,0=NØ)?1
NEW RATE?10
INPUT TØTAL EXPECTED NPV ØF DEAL YØU ARE ØFFERING
( IN $ 000 )?2315.7
HØW MUCH ØF THAT WILL BE IN CASH NØW?.8
WHAT PERCENT ØF THE SHARES WILL THAT AMØUNT BUY?80

MULTIPLIERS THAT APPLY TØ THE WHØLE CØMPANY
FØR THE PAYMENT AT THE END ØF YR 5 ARE:

YR 5 EARNINGS                     2.80
AVERAGE EARNINGS YR 4, YR 5       2.93
YR 5 SALES                        0.11

MULTIPLIERS RESTATED IN TERMS ØF REMAINING 20.  % ØF THE SHARES ARE:

YR 5 EARNINGS                    14.01
AVERAGE EARNINGS YR 4, YR 5      14.65
YR 5 SALES                        0.54

WANT TØ CHANGE ANY ØF THE MULTIPLIERS (1=YES,0=NØ)?1
INPUT THE 3 MULTIPLIERS THAT APPLY TØ THE WHØLE
CØMPANY IN THE SAME ØRDER AS ABØVE
?3,3,.15
```

DISTRIBUTIØN ØF YR 5 PAYØUT — DIST. ØF TØTAL PAYØUT

AT 3 TIMES YR 5 EARNINGS

CUM PRØB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	0	0	1852.56
.25	467.1	290.032	2142.59
.50	824.7	512.074	2364.63
.75	1142.4	709.341	2561.9
1.00	1871.1	1161.81	3014.37
MEAN	798.684	495.92	2348.48

AT 3 TIMES AVERAGE EARNINGS YR 4, YR 5

CUM PRØB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	0	0	1852.56
.25	508.8	315.925	2168.48
.50	788.4	489.534	2342.09
.75	983.4	610.614	2463.17
1.00	1715.7	1065.31	2917.87
MEAN	763.786	474.251	2326.81

AT 0.15 TIMES YR 5 SALES

CUM PRØB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	842.835	523.334	2375.89
.25	981.66	609.534	2462.09
.50	1023.5	635.51	2488.07
.75	1076.4	668.36	2520.92
1.00	1193.	740.756	2593.32
MEAN	1027.26	637.848	2490.41

*User responses are underlined.

```
IS THAT ENOUGH (1=YES,O=NO)?0
CURRENT DISCOUNT RATE IS 10 %, WANT TO CHANGE IT (1=YES,O=NO)?1
NEW RATE?15
INPUT TOTAL EXPECTED NPV OF DEAL YOU ARE OFFERING
( IN $ 000 )?2300
HOW MUCH OF THAT WILL BE IN CASH NOW?.6
WHAT PERCENT OF THE SHARES WILL THAT AMOUNT BUY?66.7

MULTIPLIERS THAT APPLY TO THE WHOLE COMPANY
FOR THE PAYMENT AT THE END OF YR 5 ARE:

YR 5 EARNINGS                     6.95
AVERAGE EARNINGS YR 4, YR 5       7.27
YR 5 SALES                        0.27

MULTIPLIERS RESTATED IN TERMS OF REMAINING 33.3  % OF THE SHARES ARE:

YR 5 EARNINGS                    20.87
AVERAGE EARNINGS YR 4, YR 5      21.83
YR 5 SALES                        0.81

WANT TO CHANGE ANY OF THE MULTIPLIERS (1=YES,O=NO)?1
INPUT THE 3 MULTIPLIERS THAT APPLY TO THE WHOLE
COMPANY IN THE SAME ORDER AS ABOVE
?7,7.5,.30


DISTRIBUTION OF YR 5 PAYOUT                    DIST. OF TOTAL PAYOUT

AT  7  TIMES YR 5 EARNINGS
CUM PROB   VALUE IN YR 5   PRESENT VALUE       PRESENT VALUE
  .00          0             0                    1380
  .25          1089.9        541.873              1921.87
  .50          1924.3        956.717              2336.72
  .75          2665.6        1325.27              2705.27
 1.00          4365.9        2170.62              3550.62
 MEAN          1863.6        926.536              2306.54


AT  7.5  TIMES AVERAGE EARNINGS YR 4, YR 5
CUM PROB   VALUE IN YR 5   PRESENT VALUE       PRESENT VALUE
  .00          0             0                    1380
  .25          1272.         632.409              2012.41
  .50          1971          979.935              2359.94
  .75          2458.5        1222.31              2602.31
 1.00          4289.25       2132.52              3512.52
 MEAN          1909.46       949.342              2329.34


AT  0.3  TIMES YR 5 SALES
CUM PROB   VALUE IN YR 5   PRESENT VALUE       PRESENT VALUE
  .00          1685.67       838.076              2218.08
  .25          1963.32       976.117              2356.12
  .50          2046.99       1017.72              2397.72
  .75          2152.8        1070.32              2450.32
 1.00          2385.99       1186.26              2566.26
 MEAN          2054.52       1021.46              2401.46

IS THAT ENOUGH (1=YES,O=NO)?0
```

CURRENT DISCOUNT RATE IS 15 %, WANT TO CHANGE IT (1=YES,0=NO)?0
WANT TO CHANGE THE DEAL (1=YES,0=NO)?1
INPUT TOTAL EXPECTED NPV OF DEAL YOU ARE OFFERING
(IN $ 000)?2300
HOW MUCH OF THAT WILL BE IN CASH NOW?.35
WHAT PERCENT OF THE SHARES WILL THAT AMOUNT BUY?51

MULTIPLIERS THAT APPLY TO THE WHOLE COMPANY
FOR THE PAYMENT AT THE END OF YR 5 ARE:

YR 5 EARNINGS	11.29
AVERAGE EARNINGS YR 4, YR 5	11.81
YR 5 SALES	0.44

MULTIPLIERS RESTATED IN TERMS OF REMAINING 49 % OF THE SHARES ARE:

YR 5 EARNINGS	23.05
AVERAGE EARNINGS YR 4, YR 5	24.10
YR 5 SALES	0.90

WANT TO CHANGE ANY OF THE MULTIPLIERS (1=YES,0=NO)?0

DISTRIBUTION OF YR 5 PAYOUT DIST. OF TOTAL PAYOUT

AT 11.2948 TIMES YR 5 EARNINGS

CUM PROB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	0	0	805
.25	1758.59	874.332	1679.33
.50	3104.93	1543.7	2348.7
.75	4301.04	2138.38	2943.38
1.00	7044.54	3502.38	4307.38
MEAN	3006.98	1495	2300

AT 11.8108 TIMES AVERAGE EARNINGS YR 4, YR 5

CUM PROB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	0	0	805
.25	2003.11	995.902	1800.9
.50	3103.88	1543.18	2348.18
.75	3871.59	1924.86	2729.86
1.00	6754.61	3358.23	4163.23
MEAN	3006.98	1495.	2300.

AT 0.439078 TIMES YR 5 SALES

CUM PROB	VALUE IN YR 5	PRESENT VALUE	PRESENT VALUE
.00	2467.13	1226.6	2031.6
.25	2873.5	1428.64	2233.64
.50	2995.96	1489.52	2294.52
.75	3150.82	1566.51	2371.51
1.00	3492.12	1736.2	2541.2
MEAN	3006.98	1495.	2300.

7. The Corning-Glass Works (CGW) Program[9]

The CGW program was developed to:

1. Aid in computing the "best" or "acceptable" cash price of acquisition candidate, taking into account its past and future (projected) performance.

2. Provide the implication of various prices on the acquirer's EPS, ROI, and P/E ratio.

3. Provide estimates of the effect on the acceptable price due to errors in estimates and/or assumptions (Risk and Sensitivity Analysis).

The model performs primarily accounting-type computations to get cash flows and then calculates ROI and other specified criteria. It can be run as a risk-analysis, as a deterministic or most likely estimate and sensitivity analysis model. In practice, the risk feature is utilized only in the last stage of computations, with most of the analyses being performed for the best estimates for sensitivity analyses, and to answer various "what if" questions posed by management, such as effects of changes of purchase price on a financial measure, or vice versa.

The basic types of estimates used in the evaluation are determined by reviewing past financial statements of the acquisition candidate, and through interviews with its management. They include:

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[9]John C. Chambers and Satinder K. Mullick, "Determining the Acquisition Value of a Company", Management Accounting, April 1970, pp. 24-39.

- Net sales
- Cost of sales in dollars or as a percent of sales
- Selling, general and administrative expenses
- R and D
- Other income
- Past and future capital requirements
- Last three years' depreciation and amoritzation estimates
- Value of undepreciated assets
- Interest and other expenses
- Working capital and inventory requirements
- Short- and long-term debt
- Taxes, etc.

The CGW program is flexible enough so that the amount of detail incorporated in the model depends on the available data and the accuracy of detailed versus gross estimates.

As in the PROSIM program (described in Section 4.4), the risk analysis is performed by (i) specifying a cumulative probability distribution for one or more input variables, (ii) performing a series of Monte Carlo trials to get the corresponding probability distribution for ROI, or some other measure. An important extra feature of the CGW model is to allow variables to be dependent upon each other.

In order to calculate the present value of the acquisition candidate, the CGW model requires that the acquirer first use the model to determine his own ROI probability distribution function, and then use the distribution mean as the appropriate discount rate to be applied against the acquisition's projected cash flows. According to the authors, this approach ensures that both firms will be evaluated on the same basis.

Once the present value of the acquisition candidate is computed, its number of outstanding shares determines the maximum price at which the shares should be traded or bought.

The CGW program can equally well be used to determine the effect of a type of transaction on (i) the EPS of the acquirer, and (ii) the dividends to be paid to the acquired stockholders. For this purpose, the program has the capacity of examining the effects of any package consisting of common, convertible preferred stock, warrants, and convertible debentures. As in most of the preceding cases, the set of viable exchange packages (i. e., packages that satisfy the minimum stated objectives of management) must be determined by a trial-and-error procedure.

The CGW acquisition analysis program is indeed a more sophisticated version of PROSIM: It performs the same kind of risk-analysis whilst allowing the user to (i) specify a much wider set of assumptions about the future, and (ii) use his own accounting rules. However, the application of the acquirer's discount rate against the acquisition's projected cash flows constitutes a serious financial mistake (unless the acquisition belongs to the same risk class as the acquirer). We have already seen that the appropriate discount rate to be applied is the acquisition's cost of capital ρ_2.

8. The COMMAND Program[10]

Developed by First National City Bank, the COMMAND (Computer Assisted Management Decisions) program is a time-sharing designed to provide management with a tool for (i) divisional or corporate forecasting, (ii) planning, and (iii) acquisition analysis.

Conceptually, COMMAND is an automated accounting framework of any company, division or plant. The user must provide for each accounting entry his best estimate for the current year's level, and future growth rates.

COMMAND is made up of six modules, each of which performs a different type of financial analysis. Although most of these modules may be used for the analysis of a subsidiary, a division or an acquisition candidate, their description will be given solely in terms of their relation to acquisition analysis.

1. PASTFLOW

This module, generally the first step in the analytical process, produces a complete trend analysis and operating ratio analysis of at most, twelve past accounting periods(either months, quarters, or years). The program serves three functions:

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[10] Leonard N. Druger, "Computer Time-Sharing Aids in Forecasting", Financial Executive, August 1972, pp. 20-23.

a. It serves as a point of reference to the corporate manager while he formulates assumptions for a forecast.

b. It focuses attention on adverse operating trends.

c. It highlights any inconsistencies between the acquisition candidate's forecast and its past performance.

2. CASHPLAN

The module takes the user's assumptions about the future and generates a complete twelve-period forecast including income statement, balance sheet, ratio analysis, source and uses of funds statement, reconciliation of working capital, capitalization analysis, cash-flow statement, and a list of the assumptions that produced the forecast. The system provides several methods of forecasting each component of a corporate balance sheet and income statement.

3. EDIT

EDIT checks the assumptions entered into the CASHPLAN forecasting program for mechanical consistency and correctness.

4. PRODPLAN

Instead of basing the acquisition candidate's forecast purely on overall revenue estimates, the user may go down to the product-line level and input the price, volume, fixed and variable cost per unit for any number of product lines. The resulting composite sales and costs are automatically fed into CASHPLAN which produces up to eight traditional financial reports. PRODPLAN enables the manager to measure the impact of a change in product mix, volume, price or unit cost on the total earnings and cash flows of the acquisition candidate.

5. <u>MERGE</u>

MERGE is used to consolidate, either on a pooling or purchase method of accounting, the financial data of the acquirer and proposed acquisition. The analyst can introduce any combination of specific alternatives for financing the acquisition. MERGE produces a complete financial profile of the new consolidated entity.

6. <u>TARGET</u>

This module takes the acquirer's established earnings objective for each of the next five years and compares them with the earnings expected from existing business activities. The difference, if any, represents the earnings gap that must be satisfied by new investments, new products, or acquisitions. Then, based upon leverage and liquidity constraints, a plan is established for financing both normal business activities and the required external investment.

TARGET calculates the amount, timing, and types of sources (how much should be debt, how much equity) for the required investment. It also prints out a complete eight-page pro-forma financial picture of the acquirer meeting its objective.

COMMAND is instantly accessible from a standard telephone anywhere in the United States, Canada, or Europe. Information entered into the system is protected through a security system.

COMMAND represents a very powerful time-sharing system for forecasting, financial planning, acquisition analysis and consolidation, product-line planning, and policy decision evaluation. All of these functions are performed simply by simulating the future activities of a firm and by translating results into accounting and financial analysis statements. To the extent, however, that the system lacks the more sophisticated techniques for dealing with risk, for performing present value analysis, and for performing sensitivity analysis, it represents a rather clumsy and costly tool for doing acquisition analysis.

9. The RAYTHEON Program[11]

Developed by Robert Seaman in 1968, the RAYTHEON program is designed to investigate in an interactive mode the impact that a prospective acquisition's operating results have on its financial results. Accordingly, the program is capable of (i) accepting relevant operational, market and financial data, (ii) generating detailed quarterly performance results for the next three years, (iii) processing substitute values in a variety of functions in a "what if" mode, and (iv) testing the profit sensitivity to sales levels.

The model is conceived of mathematical expressions for each of the sales, cost, balance sheet, and cash flow items normally associated with the measurement of operating and financial performance. All constants assigned to such expressions can be changed at any moment by simply typing the new values at the terminal keyboard. The simulator program accepts the changes and immediately recomputes all affected values throughout the model. Upon command, the results of these revisions are displayed for further consideration by the user.

At the end of each simulation exercise, a sales sensitivity test of the break-even point can be made. Also, the program displays for

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[11] Robert L. Seaman, A Simulation Approach to the Analytical Aspects of Business Acquisition Evaluation, Unpublished Master's Thesis, Sloan School of Management, M.I.T., June 1968.

the user the circumstances of all revisions made to the model's mathematical formulations.

The output of the model consists of the following reports and statements, given by quarter-year periods and year totals for three future years:

1. Operating results.
2. Balance sheet statements.
3. Source and application of funds statements.
4. Consolidated reports for parent and acquisition.

The inputs to the model include forecast of:

1. Operating Items

   - Sales
   - Manufacturing costs (variable, fixed, other)
   - Operating margins
   - General, selling and administrative expenses
   - R and D expenditures (new product and existing)

2. Balance Sheet Items

   - Current Assets
   - Plant and equipment
   - Other non-current assets
   - Current liabilities
   - Long-term debt
   - Owner Equity

3. Cash Flow Items

- Depreciation
- Investment in plant and equipment
- Loan proceeds and paybacks
- Other sources and applications
- Working capital and requirements

The RAYTHEON program for acquistion analysis explores in depth the operational aspects of a prospective acquisition. It does this in a manner which provides a great degree of flexibility to the user. Its overall scope, however, is very limited. The program fails to provide the user with (i) many of the elements which are important in acquisition analysis (financial ratios, per share data, etc.), and (ii) the means of determining a price for the acquisition.

C. The Relationship of the Programs to Our Framework of Analysis

One of the main characteristics of the acquisition analysis, framework presented in Chapter VI, is the iterative nature of the computations. This feature makes the computer a nearly indispensable aid to the manager performing the analysis. In this section, we attempt to indicate where and how the several programs described so far may be used. Instead of referring to each program individually and indicating in which phase of the analysis it may be used, we shall do the inverse, i.e., we shall refer to a step of the analysis and indicate which programs may apply as aids. To the extent that most programs are nothing other than accounting simulators, their main use is to project the future cash flows required to determine the fair market value of the prospective acquisition. Furthermore, because the programs generate the future balance sheets and operating statements of the company, their results may be useful in indicating to the buyer what adjustments to the price and package to be offered may be required to bring the future financial results in line with his objectives.

1. Projection of the Acquisition's Future Cash Flows

To project the future performance of the prospective acquisition, there are two types of programs: (i) those which perform the pertinent simulations in a deterministic fashion, and (ii) those which use the Monte Carlo approach to derive the probability distributions of future cash flows. In the first group, we have the COMMAND, CGW, McKinsey and RAYTHEON programs, their order of citation being that which we attribute to their capabilities and degree of sophistication. In the second group, the relevant programs are, in order of capability, the CGW and PROSIM programs.

To the extent that these programs simply extrapolate into the future the present performance and financial status of the firm, according to the best estimates of management, the projected cash flows can be made to include any synergistic benefits accruing from the consolidation by inputting higher estimates of future performance.

2. Determination of the Acquisition's Fair Market Value

Once cash flows have been estimated for a number of n years into the future, the fair market value of the firm is determined by discounting the cash flows and the terminal value of the firm at the risk-adjusted rate of return r required by the market. The only programs which perform present value analysis on the projected future cash flows are PROSIM and CGW. The first of these is rather limited in its real world applications as it is conceived to be primarily an educational tool. CGW, on the other hand, is quite flexible insofar as the user's assumptions and requirements are concerned, and may, therefore, constitute a useful aid both to perform the projections of future cash flows (in a deterministic or probabilistic fashion) and compute the present value of those cash flows. It is important, however, that the analyst not use the discount rate computed by the program[1], but input the appropriate discount rate as is determined in Chapter III.

3. Adjustments to the Maximum Price Before Taxes

Because most programs generate pro-forma balance sheets, operating and use-of-funds statements of the consolidated company, their practical use is more directed at helping managers evaluate an acquisition in terms of its "book impact" than at determining its addition to the value of the firm. This confirms what is discussed in Chapter IV, namely, that issues such as resulting EPS, debt-to-equity ratio and amount of retained ownership are usually given considerable attention in evaluating the attractiveness of a prospective acquisition.

In this context, the programs which are useful in performing this type of analysis are COMMAND, REALSCAN, MERGERESTIMATOR and McKinsey program.

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[1]The program uses the acquirer's expected rate of return as the discount rate.

D. Comparison of Programs

To the extent that a description has been provided for each program, the best way to contrast them is through a concise listing of their major characteristics. This is done below:

Table 8-14

Functional Characteristics of the Programs

	BATCH	INTERACTIVE	ACCOUNTING FRAMEWORK	PRESENT VALUE ANALYSIS	PROBABILISTIC ANALYSIS	TREND ANALYSIS	MULTI-PERIOD ANALYSIS	CONSOLIDATION ANALYSIS & REPORTS	CANDIDATE SCREENING	CONTINGENT PAYMENT ANALYSIS	OPERATIONS ANALYSIS OF CANDIDATE	PAYMENT PACKAGE DETERMINATOR
1. McKinsey	√		√				√	√	√			
2. QUICKSCAN	√							√	√			
3. MERGERESTIMATOR	√		√				√	√	√			√
4. REALSCAN		√	√			√	√	√	√			√
5. PROSIM		√	√	√	√		√					
6. PRODEP		√			√		√			√		
7. CGW		√	√	√	√		√					
8. COMMAND		√	√			√	√	√	√		√	
9. RAYTHEON		√	√				√				√	
10. FUSION*		√	√			√	√	√				√

*described in Chapter IX

CHAPTER IX

The FUSION Program

In this chapter, we describe a computer program which we designed to perform a function that none of the previously reviewed programs does, namely that of being able to structure a merger package according to management's specifications about desired future financial performance for the consolidated company.

The first section of the chapter gives general considerations about time-shared acquisition analysis and describes some of the advantages of interactive programs as compared to batch ones. The second section, describes the scope and domain of applicability of FUSION, and relates its functions to the acquisition analysis framework proposed in Chapter VII.

In the third section, we describe FUSION's input requirements and illustrate how the program is to be used; the chapter continues with an evaluation of the program as a whole, and with suggestions for improvement. In Appendix G, we include the output of a sample session using the program.

A. A Note on Time-Sharing Acquisition Analysis

Time-sharing is an option available on the majority of third generation computers which gives several users the ability to use the computer simultaneously. Although the computer services each connected user in turn, it does it so rapidly and in such small time segments that each user has the impression that he has the machine all to himself.

The user communicates with the computer through a remote terminal, which may be a simple teletypewriter or a more sophisticated visual display (CRT) unit resembling a television set. The terminal permits the user: (i) to insert data or programs into the computer; (ii) to call upon data or programs already stored on tape or disk; and (iii) to perform other manipulations of data as required.

When a user is connected in a time-sharing mode with a computer, and if a suitable program is available for use, he may carry on a "conversation" with the computer. This makes it possible for him to combine his talents as a decision-maker with the calculating power of a computer.

In the context of acquisition analysis, this conversational mode has several advantages:

i. Instead of being required to put together all the input information at once, as is the case with batch processing, the user can change input information as his calculations proceed. Time-sharing programs are designed to request information input from the manager immediately before it is needed. In this way, the manager need not make decisions until they are absolutely necessary.

ii. The multiplicity of alternative ways to acquire a company and the variety of variables to be taken into account, usually lead members of management, in the course of a merger review, to ask questions beginning with: "What would happen if . . . ?" These "what if" questions require fast answers. Using a time-sharing program, the manager or analyst to whom such question are addressed can type at the terminal the appropriate request and obtain an answer within second.

iii. By experimenting with a variety of operating and financial estimates for the parent and candidate companies, a manager has the opportunity of establishing complete familiarity with the range of possible implications that the acquisition may entail. The flexibility which time-sharing puts a his disposal, enables the manager to gain this precious insight in a much shorter period of time than otherwise required.

iv. To the extent that time-sharing programs are easier to learn and write than batch-processing languages, it is possible for an executive to rapidly acquire proficiency in programming and so create his own programs without having to interface with the company's computer staff. Since he himself is the one most familiar with analytical methods and objectives, this programming capability permits him to generate programs faster and with fewer interpersonal problems. Also, this freedom allows him to experiment with new and different analytical techniques since he can test a technique as soon as he programs it.

B. Introduction to FUSION

The purpose of FUSION is to help management determine the attractiveness of an acquisition and structure the acquisition payment package. FUSION will (i) assist in forecasting the future earnings of the acquiring and selling companies, (ii) determine from among the available financing media the mix of securities to be used as payment which best fits into the acquirer's short- and long-range financial plans, and (iii) help in analyzing the financial impact of the acquisition.

To assist in forecasting future earnings, FUSION requires as inputs the current estimated and past five years' earnings, net of any extraordinary items. The program then fits through the data the curve which best "explains" the past, and uses it as a proxy to project income for the next five years. The analyst is free, of course, to use these projections or to generate his own estimates in analyzing the impact of the acquisition upon the parent company.

In order to be used as a package structuring tool, FUSION requires that the types of financing media to be used as payment be specified. The available options include cash, common stock, convertible preferred shares and bonds. The information required for the options includes the interest or dividend rate, the conversion ratio and sinking fund requirements.

The user is then given the choice of either specifying the mix of securities in the package, or letting the program do so. When the latter alternative is chosen, FUSION makes use of the goal programming technique described in Chapter VII and requires the manager to specify his subjective estimates of the intangible costs associated with not attaining his goals. FUSION then determines the financing package which meets the corporation's goals at the lowest cost.

To help in analyzing the financial impact of the acquisition, FUSION simulates the future performance of the consolidated firms for four years into the future.

The outputs from the model include the (i) regression coefficients of best fit curves used for forecasting future income, (ii) estimated after-tax financial results for the next four years, (iii) proposed transaction package, and (iv) tables for testing the sensitivity of the package solution to changes in the goals and constraints.

C. Using FUSION

This section illustrates the applicability of FUSION[1] and describes how the program can be used.

As is the case for most time-shared programs, a session is initiated by establishing a telephone connection with the computer and by identifying oneself to the computer.

From then on, the program will ask the operator for the required input information at each step of the analysis. All questions are asked in plain English language. With the aid of a short pamphlet of instructions, the user is simply required to type all the pertinent data at the terminal. For most purposes, the user need not have any proficiency in programming to run the program competently. To conclude a session the user must simply type a zero (0) when the program asks him the question "WHAT NOW?" or alternatively, press the ATTENTION button on the terminal at any point of the analysis.

[1]The program presented here does not constitute what we envision to be the final version of FUSION.

The initial part of the program requires that data related to both the acquirer and prospective acquisition be fed to the computer. These data are the base from which subsequent calculations are made. The information required for each company includes:

i. Past five years' earnings history

ii. Current year's estimated earnings.

iii. Number of outstanding shares.

iv. Market value of shares, if any.

v. Book value of shares.

vi. Long-term debt outstanding (book value)

vii. Working capital balance.

The initial entry of these data is not a firm commitment for the entire analysis. The user is given several opportunities during the analysis to adjust or completely change the base data.

Once the companies' data has been entered, the program allows the user to investigate the impact of acquiring the candidate firm with cash and/or any combination of the following types of securities:

i. Common stock

ii. Convertible preferred

iii. Bonds

iv. Cash

The user is then asked to either specify the mix of securities to be issued or to specify the set of goals and associated implicit costs which he wishes the package to achieve.

Under each of these alternatives, the user is allowed to control influencing variables such as earnings, premium to be paid, percentage mix of package to be offered, expected conversion schedule of the preferred stock issued, dilution of earnings, and effective dividend rate desired.

The output of the program includes:

i. Package needed to be offered.

ii. Combined earnings.

iii. Combined earnings per share.

iv. Earnings per share issued.

v. Percentage dilution of earnings.

vi. Resulting percentage ownership.

vii. Resulting capital structure

viii. End of first year working capital balance.

D. Evaluation of FUSION

Drawing upon the ideas and formulation presented in Chapter VII, FUSION was designed with the main objective of allowing a manager to structure rapidly the package of securities to be used as payment for an acquisition. For this purpose, the program was originally provided with the capability of translating the manager's specified deviation penalties (usually dollars per percentage point of deviation) into the internal goal programming penalties. This proved to be impractical for two reasons:

i. It is extremely hard for a manager to attach a dollar value to a percentage point of EPS, ownership or debt-to-equity ratio deviation from target. As a result, the manager can at most specify which deviations he regards as highly unfavorable and accordingly attach to them very high penalties (i.e., make the goal become a "hard" constraint).

ii. Because the user does not know what conversion factors are being applied to his penalties in order to convert them into internal penalties, he loses the capability of balancing his several objectives.

In order to remedy these shortcomings, FUSION's internal logic was "exteriorized", that is, all questions were modified to allow the manager to attach his penalties to the interior deviations (which in most cases are expressable in dollars). This modification considerably improved the effectiveness of the program.

Because in its present stage of development, FUSION is not set up to perform multi-period analysis (for example EPS growth is not taken into consideration), most goals are usually exactly met by entering convertible preferreds into the proposed package solution. Inasmuch as convertible preferred stock does not dilute the immediate EPS or the degree of retained control as much as common stock, nor does it adversely affect the debt-to-equity ratio as much as debt, it usually replaces any excesses of stock or of bonds in the final solution.

Experience with FUSION has revealed that, although no computer experience is required from the user, it is necessary to possess a working knowledge of linear programming and of sensitivity analysis to derive the maximum use of the program. This fact indicates that much of the future work to be invested in developing FUSION should go into rendering it a more practical tool for users not acquainted with the program's internal analytical techniques.

Apart from these comments, which have been directed at FUSION's package determinator subroutine, we think the other subroutines require further development. Specifically:

i. The input/output subroutine should be rendered more flexible.

ii. The program should be provided with a discounted cash-flow package.

iii. The user should be allowed to assess future outcomes in probabilistic terms.

iv. The overall accounting framework of the program should be rendered more flexible.

CHAPTER X

Summary and Suggestions for Further Research

Throughout this thesis, we have examined what methods, techniques and computer-aids can be used to assess the value of a prospective acquisition. To increase the scope of our study, we chose to deal with companies which are privately-owned, that is, companies for which a market value is not known. This led us to the general problem of estimating the fair market value of a firm.

Once this issue was examined, we entered the main subject of this thesis: how a buyer may determine the price to be offered for a prospective acquisition. A survey of the literature on mergers and acquisitions revealed that the techniques commonly used imply that many firms center their financial analysis on the impact that the acquisition will have on their books. Several of the issues which are usually considered when determining the purchase price of an acquisition candidate were discussed.

We then examined the valuation approaches that financial theory suggests for acquisition analysis purposes, and found that in essence, the approaches proposed are the same as those used to evaluate internal investment projects, i.e., discounted cash flow and portfolio analysis.

Using this framework of analysis and recognizing the fact that the synergistic effects generated by a merger usually make an acquisition worth more to a buyer than its fair market value as a separate entity, we examined ways by which the synergistic benefits expected to accrue from the consolidation may be valued. Specifically, we proposed a framework of analysis which focuses primarily on the synergistic benefits as a means of assessing what premium over fair market value the acquirer may offer for an acquisition.

We then focused our attention on the financial means through which an acquisition is transacted, and applied goal programming to the problem of structuring the payment package according to the acquirer's objectives for the consolidated companies' future performance.

The study proceeds with a survey of a number of computer programs designed to aid the decision-maker in performing the financial analysis of a prospective merger. Our evaluation of these programs led us to create our own program and to computerize the goal programming formulation previously developed to structure the payment package. We conclude our thesis with a description and illustration of the use of this program.

In perspective, the present work could be profitably complemented or extended by further research in several areas. As stated in the Introduction, we were unable to collect much data from the field. To this extent, an attempt should be made to solicit cooperation from investment bankers, consulting houses and capital venture firms to establish which valuation methods are being employed in practice.

Furthermore, some field research would probably allow the addition of a number of real life cases, which are noticeably lacking in this study. The availability of such examples would make a useful contribution towards diffusing such techniques as probabilistic cash flow analysis and adjusted present value among valuation practitioners.

Individual valuation techniques could also be improved. For instance, in the Adjusted P/E Technique, better ways of computing the weights to be attached to each factor could be derived. In the goal programming application, more research needs to be carried out in order to improve the way the user can specify the penalties to be attached to deviations from his goals.

The framework of analysis that was presented is general enough to take both financial and operational synergistic benefits into consideration. In this thesis, we were mainly concerned with the financial aspects of the acquisition. We suggest further research focus on the operational synergism which may result from a consolidation.

Furthermore, in the light of some of the research that is presently going on in the area of human resource management, factors that were heretofore defined as intangibles may, in fact, turn out to be quantifiable, and, therefore, amenable to explicit treatment in valuation analysis.

More work needs to be channelled into extending the present capabilities of FUSION as an aid to executive decision-making. Additional modules should be designed to augment the program's functional characteristics, so that ultimately, each step of the proposed framework of analysis may be carried out with the aid of the computer.

APPENDIX A

Adjusted P/E Valuation Method

The problem addressed in this appendix is to value a firm by submitting it to a direct comparison with other firms operating in the same industry grouping. This comparative analysis serves to obtain an adjusted P/E multiple to apply against an average past earnings figure for the firm.

Although extremely subjective in nature, this line of thought is followed by a large number of consultants, accountants, and bankers in valuation studies[1].

The process requires the analyst to:

i. Collect selected data of the firm and other firms operating in that industry and compute analysis figures.

ii. Construct a hypothetical concern reflecting the averages of the particular industry grouping.

iii. Submit the firm and the hypothetical standard to a direct comparison to determine the adjusted P/E.

iv. Determine the firm's value by applying the adjusted P/E to a representative earnings figure.

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[1]Especially in Europe.

The description provided below is taken from an actual valuation study performed by the Dutch firm of Pierson, Heldring and Pierson (Amsterdam)[2]. The process is rather rudimentary and accordingly, wherever deemed necessary, we have suggested improvements. For simplicity, it is assumed that the compilation of all pertinent data has been performed. An example of how we would implement the method follows the description.

We caution the reader not to view this valuation process, as having any theoretical value[3]. The real benefits to be derived from it, stem from the analysis of the firm and of its industry which need to be performed to determine the adjusted P/E.

Step 1: <u>Compute the Financial and Operating Performance Figures to be Used</u>

Of the many financial and operating ratios which can be computed for valuation analysis purposes, the following are used:

a. Return on Investment (profitability)

b. Profit Growth (potential)

c. Profit Quality (predictability)

d. Equity/Debt Ratio (solvency)

e. Current Ratio (liquidity)

Each of these figures is computed as follows:

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[2] The name of the valuated company has been withheld by request of its management.

[3] The method can be rendered more scientific if multi-correlation or discriminant analysis is used to express the industry's P/E as a function of the appropriate financial and operating performance indexes.

a. Return on Investment

Actual: average profit of last three fiscal years in percent of equity. Profit and equity are taken essentially as reported by companies. Adjustments are made for nonrecurring and other items.

Proposed: time-weighted average of the last three fiscal years' ROA (return on assets). Use ROA instead of ROE in order not to take the firm's capital structure twice into consideration (i.e., here and in the solvency test). Time-weight the ROA's so as to give more importance to the near-past over the more distant one. Compute ROA as:

$$\text{ROA} = \frac{\text{Earnings before interest and taxes}}{\text{Total assets}}$$

or as:

$$\text{ROA} = \text{Before interest and tax profit margin} * \text{Asset turnover}$$

where,

$$\text{Profit Margin} = \frac{\substack{\text{pretax and interest} \\ \text{operating income}}}{\text{Sales}} + \frac{\substack{\text{pretax and interest} \\ \text{nonoperating income}}}{\text{Sales}}$$

and

$$\text{Asset Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

b. <u>Growth</u>

Actual: approximate absolute increase of net profit as average over the last five fiscal years (on the basis of compound interest), i.e.,

$$g = \frac{\text{Profit (Year 5)}}{\text{Profit (Year 1)}} - 1$$

Proposed: annual compounded real growth rate provided by reinvested net income. Use the price indexes of base and terminal year to determine deflated total percentage growth.

$$g = \frac{\text{Profit Year 5}}{\text{Profit Year 1}} * \left(\frac{\text{Price Index Year 1}}{\text{Price Index Year 5}} - 1\right) * \frac{\Delta RE}{\Delta EQ}$$

where,

ΔRE = change in Retained Earnings.

ΔEQ = change in total shareholder's equity.

c. <u>Profit Quality</u>

Actual: average percentage deviation of ROE from the average of the highest and lowest ROE in the last five fiscal years.

Proposed: coefficient of determination (r^2) for the logarithmic or linear (depends on the assumptions made about growth) regression curve of the last five fiscal years' ROE. The closer r^2 is to 1, the more predictable the EPS of each year. This method, although complicated, is basic to forecasting analysis.

If unable to implement this method, use variance of ROE, i.e., the sum of the squared deviations of each year's ROE to the average $\overline{ROE}$ of the last five fiscal years.

d. <u>Equity/Debt Ratio</u>

Actual: equity/loan capital.

Proposed: compute solvency ratio as[4]

$$\frac{\text{Shareholders' Equity + long-term debt}}{\text{Shareholders Equity}}$$

e. <u>Current Ratio</u>

Actual: current assets divided by current liabilities.

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[4] See Appendix B for explanation.

Proposed: same but adjusted if necessary[5].

Step 2: Construct Industry Averages

Once these indices have been computed for the firm, they have to be compared to those pertaining to the industry. To obtain the latter, the analyst can consult financial information supplied by investment companies, central bank research institutes or bureau of statistics.

When the information is not publicly available, industry averages may have to be computed using past financial statements of representative companies in the industry.

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[5]At any point in time, the current ratio may be distorted by seasonal influences, slow-moving inventories or abnormal payment of accounts payable just prior to the balance sheet date, etc.

The resulting current ratio CR' after a payment equaling x percent of total current liabilities is made, can be expressed in terms of the current ratio CR before the payment is made as:

$$CR' = \frac{CR - x}{1 - x} \quad \text{and} \quad \frac{dCR'}{dx} = \frac{1 - CR}{(1 - x)^2}.$$

This means that a company for which CR < 1, can improve its CR for balance sheet purposes by paying as much of its current liabilities before the end of the fiscal year. The opposite holds for a company with a CR > 1. No change when CR = 1.

Step 3: Determine the Adjusted P/E

Actual: This is performed by selecting for each ratio a weight ω_i and using the following equation:

$$PE_f = \frac{PE_i}{6}\left(2\,\frac{ROE_f}{ROE_i} + \frac{G_f}{G_i} + \frac{PQ_i}{PQ_f} + \frac{ED_f}{ED_i} + \frac{CR_f}{CR_i}\right)$$

where

i = industry

f = firm

ROE = return on equity

G = profit growth

PQ = profit quality

ED = equity/long-term debt

CR = current ratio

PE = P/E ratio

Proposed: According to our suggestions, PE_f would be computed similarly, but using our proposed variables, as:

$$PE_f = \frac{PE_i}{\sum_{n=1}^{5}\omega_n}\left(\omega_1\,\frac{ROA_f}{ROA_i} + \omega_2\,\frac{G_f}{G_i} + \omega_3\,\frac{r_f^2}{r_i^2} + \omega_4\,\frac{TAE_i}{TAE_f}\right.$$

$$\left. + \,\omega_5\,\frac{CR_f}{CR_i}\right)$$

where,

ROA = return on assets

r^2 = coefficient of determination

TAE = Total Assets/Equity

ω_n = weight given

Step 4: Determine the Firm's Value

In order to do this, it is necessary to compute an earnings figure which best represents the present potential of the firm. The described technique suggests that the figure be calculated as the average net profit over the last three fiscal years.

We propose that the figure be calculated as the time-weighted average of the last three fiscal years. The time-weights should correspond to those applied in Step 1 against the ROA's.

Example

Company XYZ

Major Financial Information ($000's)

	1967	1968	1969	1970	1971
Sales	1,455	1.684	2,132	2,470	3,357
EBIT	57	95	140	167	155
Net Income	26	45	72	82	59
Current Assets	710	750	1,077	1,495	2,075
Total Assets	820	860	1,187	1,695	2,565
Current Liabilities	544	463	582	976	1,562
Long-Term Debt	23	27	50	37	249
Stockholders' Equity	253	370	555	682	754
Outstanding Shares	210	260	361	603	650
Retained Earnings	21	36	50	75	81
Profit Maring (%)	3.92	5.64	6.56	6.76	4.62
Asset Turnover	1.77	1.96	1.80	1.46	1.30
ROA(%)	6.93	11.06	11.82	9.87	6.00
ROE(%)	10.27	12.16	13.00	12.02	7.82
Marginal ROE growth rate (%)		16.24	14.60	7.87	-3.20
EPS ($)	.124	.172	.200	.136	.090
Leverage (D+E)/E	1.09	1.07	1.09	1.05	1.33
Current Ratio	1.30	1.62	1.85	1.53	1.32

On the basis of this information, the adjusted P/E is determined as follows:

1. ROA

Time-weighted average ROA:

$$ROA = \frac{1}{6} * 1.82 + \frac{2}{6} * 9.87 + \frac{3}{6} * 6.00 = 8.26$$

2. Growth

a. Inflationary effect $= \frac{112.3}{109.1} = 1.03$

b. Total Growth $= \frac{59}{26} = 226.92\ \%$

c. Deflated Total Growth (b)/(a) 220.31 %

d. Annual Compounded Growth = 17.1 %

e. Change in Retained Earnings = 60

f. Change in Shareholder's Equity = 501

g. Internal funds ratio (e)/(f) = .1197

h. Adjusted Growth Rate (d) x (g) = 2.048 %

Industry = 10 %

3. Profit Quality

a. Linear Regression of ROE

Year	x	x^2	ROE y	xy	Trend Value y_t
(1)	(2)	(3)	(4)	(5)	(6)
1967	-2	4	10.27	-20.54	12.786
1968	-1	1	12.16	-12.16	11.920
1969	0	0	13.00	0	11.054
1970	1	1	12.02	12.02	10.188
1971	2	4	7.82	15.64	9.322
Total	0	10	55.27	-8.66	

$$a = \bar{y} = \frac{\sum y}{n} = \frac{55.27}{5} = 11.054$$

$$b = \frac{\sum xy}{\sum (x^2)} = \frac{-8.66}{10} = .866$$

Regression Equation

$$y_t = 11.054 - .866 * y$$

b. Coefficient of Determination

Year	$y_t - \bar{y}$	$y - \bar{y}$	$(y_t - \bar{y})^2$	$(y - \bar{y})^2$
1967	-1.732	-.0784	2.999	.0615
1968	.866	1.106	.750	1.223
1969	0	1.946	0	3.787
1970	.866	.966	.750	.933
1971	1.732	3.234	2.999	10.459
Total			7.498	16.464

$$r^2 = \frac{\sum (y_t - \bar{y})^2}{\sum (y - \bar{y})^2} = \frac{7.498}{16.464} = .455$$

4. Solvency

$$\frac{\text{Long-term debt + Shareholder's Equity}}{\text{Shareholder's Equity}} = \frac{249 + 754}{754} = 1.33$$

Industry ratio: 33%

5. Current Ratio

$$\frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{2,075}{1,562} = 1.32$$

Industry's ratio = 1.49

6. Time-Weighted Average Net Earnings

$$\frac{1}{6} * \$72 + \frac{2}{6} * \$82 + \frac{3}{6} * \$59 = \$68.88$$

7. Adjusted P/E Computation

		Firm X	Industry Standard	Ratio	Weight	Product
1.	ROA	8.26%	10.00%	.826	.40	.33
2.	ROE Growth	2.05%	10.00%	.205	.15	.03
3.	ROE Quality	.455	.70	.65	.20	.13
4.	Solvency	1.33	1.40	1.05	.15	.16
5.	Liquidity	1.33	1.33	1.00	.10	.10
Total					1.00	.75

$$PE_{firm} = .75 * PE_{industry} = .75 * 9.18 = 6.885$$

$$\text{Value of firm (\$000's)} = PE_{firm} * \$68.88 = \underline{\$474.240}$$

APPENDIX B

Factors Affecting the P/E Ratio

This appendix considers those factors which most directly affect the P/E ratio of a firm and thereby provides a rationale for the factors which are considered by the Adjusted P/E Valuation Method.

1. Earnings and Growth Rates

The prospect of future earnings per share (EPS) growth is the obvious primary influence affecting the P/E multiplier. The analysis necessarily begins with historical data on the firm's earnings and past growth rates and follows with the extrapolation into the future of the relevant data. In doing so, it is vital to consider many factors including, but not limited to, the economic climate of the industry in which the firm operates, and the health ability, vitality and age of management.

2. Volatility of Earnings

Investors value minimum fluctuations from the anticipated earnings trend line. In other words, lower risks are associated with stocks which appear to promise lower per-share earnings volatility. Correspondingly, investors capitalize earnings at a higher P/E when a low volatility of earnings can be associated with a particular stock.

3. Dividends

The effects of a firm's dividend policy on its stock price is a much debated issue. One school of thought holds that capital gains expected to result from earnings retention are more risky than are dividend expectations and that accordingly, the earnings of a firm with a low payout ratio are capitalized at higher rates than are the earnings of a high payout firm. Another school of thought subscribes to the view that any effect that dividends have on the price of a firm's stock is primarily related to information about expected future earnings conveyed by a change of the firm's dividend policy. Recalling that corporate managements dislike cutting dividends, this school asserts that a dividend increase favorably affects a stock's price by conveying to stockholders the idea that management expects the recent earnings increase to be permanent. Many disagree with this assertion and argue that to the extent that a low retention rate may be interpreted as meaning that a firm is running out of internal investment opportunities, an increase of the dividend payout ratio adversely affects a stock's price.

4. Book Value Per Share

Book values are now generally considered to be of relatively little value in determining a company's value, since they merely represent the historical investments that have been made in the company. However, to the extent that the book value is an index of the amount of physical facilities available for production and, therefore, of the potential future contributions that can be obtained under effective management, it is a factor that affects the P/E multiplier.

5. Capital Structure

The relative amounts of debt and equity used in a firm, or in other words the leverage employed, is one of the main determinants of the risk to which a firm and, therefore, its owners, are exposed. If the firm earns more (less) on the borrowed funds, than it pays on interest, the return to the owners is magnified (reduced).

Insofar as the utilization of leverage increases, the volatility of earnings, the P/E multiple attributed by the market to a company's stock may be adversely affected (i.e., increased).

6. Liquidity

A firm's liquidity position is an indicator of its ability to meet its maturing short-term obligations. The current ratio, that is, the ratio of a firm's current assets to current liabilities, indicates the extent to which the claims of short-term creditors are covered by assets that are expected to be converted to cash in a period roughly correspondingly to the maturity of the claims.

The quick ratio, or the ratio of current assets minus inventories to current liabilities, is a stricter liquidity indicator since it measures a firm's ability to pay off its short-term obligations without relying on the sale of its inventories.

7. Industry Group and Position of the Firm Within Its Group

Companies which participate in recognized growth markets are apt to bright futures and will, therefore, receive recognition from investors by witnessing a high P/E ratio. The absolute value of this ratio will depend, however, on how the company compares with the others within the same industry group. In performing the comparison, investors usually examine such factors as have been already described and evaluate them in the light of the published industry averages.

8. Trading Features of the Stock

The liquidity of a stock, that is, the extent to which a stock can be quickly sold, and the depth of the market in that particular stock, that is, the extent to which the stock can be traded without affecting its price, are important determinants of a stock's market price.

In general, the more liquid the stock and the deeper its market, the higher the corresponding P/E ratio, all other factors being equal.

APPENDIX C

Determination of the Discount Rate: The Cost of Capital

The determination of the appropriate discount rate to be used in any capital-budgeting context, has been a much debated issue and for all practical purposes, there is no one single answer. Nevertheless, some choices seem to be worse than others.

For instance, using past return on capital as the discount rate, seems a poor criteria because a company with bad earnings would tend to perpetuate past failures; a company with high earnings would forego profitable investments unless they returned the historic rate[1].

Moreover, the argument is sometimes made that the cost of financing a project is the cost to service the package of securities that are issued to pay for the transaction. This statement implies that the cut-off rate (i.e., the marginal cost of capital) at which projects are rejected, would depend on the particular structure of the package issued.

There seems to be a basic fallacy in this argument[2]. Assume that a firm has an after-tax cost of debt of 3 percent and that the after-tax cost of equity is 10 percent. Further, assume that the firm is not contemplating changing its long-term financial structure, that is, the relative proportion of debt-to-equity. Following the criterion above, if

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[1] John F. Childs, "Profit Goals for Management," Financial Executive, February 1964.

[2] J. F. Weston, E. F. Brigham, "Managerial Finance", Holt, Rinehart and Winston, 1969.

the firm were to finance the next investment project with an all debt package, the cut-off rate allowed would be 3 percent. Conversely, if the same investment were to be financed with an all equity issue, the minimum cut-off rate applicable would be 10 percent.

The consequence of such a policy is that if through an all-debt financing of a project yielding 3 percent, the firm exhausts its debt capacity, the cut-off rate for the next project will have to be 10 percent. Hence, if a 9 percent project comes along, the firm would have to forego the opportunity to invest in it, although its yield is three times as much as the last project. This policy would clearly be non-optimal in maximizing the returns to the stockholder.

The fallacy resides in the fact that one could not sell debt without having some common equity. In selling debt, one uses up some of the debt capacity that the present level of equity provides. The "real" cost of issuing debt, therefore, is the cost of servicing the interest plus an extra amount that reflects the opportunity cost of the debt capacity which is provided by a favorable debt-to-equity ratio. Similarly, the "real" cost of issuing equity is, from an overall firm's point of view, the return demanded by the investors less the value of the additional debt capacity that it provides.

The method that seems to be more widely recognized in theoretical circles, yet lends itself to practical applications, is the use of the cost of capital. If we take this view, it would seem that, under the assumption that permanent changes in the financial structure of the firm are not contemplated, the cost of capital should be computed as the weighted average of the cost of the individual securities, making up the total capitalization of the firm. This should be used as the minimum discount rate in evaluating projects of average risk relative to the company.

This is in recognition of the fact that while it is difficult to raise capital in strictly the same proportions as the firm's financial structure, over time most firms are able to finance in roughly a proportional manner. That is, while a firm may finance with debt in one instance and with common in another, over a period of time, it will make sure that the relative proportions of outstanding debt and equity remain constant and equal to a desired ratio. In determining the firm's cost of capital, one should look at the firm as a going concern: short-term fluctuations are of little interest.

In practice, to compute the weighted average cost of capital, one can use the "textbook" formula:

$$\rho = (1 - T_c)\, i \,\frac{D}{D + E} + r \,\frac{E}{D + E}$$

where

i = current average yield to maturity on the firm's bonds

r = expected rate of return on the firm's stock

D = market value of debt

E = market value of equity

T_c = corporate tax rate

ρ = hurdle rate

The assumptions that allow the use of the textbook formula are:

i. The risk characteristics of the investment under consideration are similar to those of the firm's existing assets.

ii. Adopting the investment cum financing does not change the firm's debt-equity ratio.

iii. The investment under consideration supports perpetual debt (the project is long-lived).

In what follows, we will examine the relevant formulas to be used, when the above assumptions no longer hold.

Case 1 Assumption (i) does not hold

If the new investment is in a different operational risk class, one can make use of the risk-equivalent cost of capital whereby the investment is financed in such a way as to keep the risk to the equity holders constant. The risk-equivalent discount rate can be obtained from the following formula:

$$\rho' = (1 - T_c)\, i \frac{D'}{D' + E'} + r \frac{E'}{D' + E'}$$

where $D'/(D' + E')$ and $E'/(D' + E')$ are the weights according to which the investment must be financed if r is to remain unchanged. Tuttle and Litzenberger make explicit the assumptions behind this technique and provide a way to compute the weights. We cover their approach in Appendix D.

Case 2 Assumptions (i) and (ii) do not hold.

If by virtue of taking on the new investment, either the operating or the financial risk characteristics of the firm change, then one can use the Modigliani and Miller[3] (M-M) formula:

$$\rho = \rho_{o2}(1 - \lambda\, T_c)$$

where

ρ_{o2} = firm's cost of capital assuming all-equity financing

λ = portion of debt used in financing the project

Case 3 Assumptions (ii) and (iii) do not hold.

When the leverage is changed and when the project considered is of limited life, the M-M formula may still yield

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[3]Modigliani, F. and Miller, M. H., "The Cost of Capital, Corporate Finance and the Theory of Investments" The American Economic Review, Vol. 48, No. 3, June 1958, pp. 261-97.

a correct answer. But, in this case, it should be used with care and recogniaing the fact that it may lead to a wrong result. It is at best a rule of thumb.

In order to get around this limitation, Myers[4] has proposed the use of the Adjusted Present Value (APV) method as a practical alternative to the analysis required by other cost of capital concepts.

In making use of this technique, one first discounts the after-tax, before-interest cash flows of the acquired firm as if it was equity financed. The appropriate discount rate to be used in this case is ρ_{o2}. To the present value of these cash flows, one then adds the present value of the tax shield generated by taking on the additional amount of debt ΔD_t that the assets of the firm can support. The appropriate formula for computing APV follows:

$$APV = \sum_{t=1}^{n} \frac{C_t}{(1+\rho_{o2})^t} + \sum_{t=1}^{n} \frac{T_c \, i \, \Delta D_t}{(1+i)^t}$$

This method, while mathematically more complex, is general and will apply even to those cases where the M-M formula fails to give the correct answer. In order to determine ρ_{o2}, one can use the following rule of thumb:

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[4] S. C. Myers, On the Interactions of Corporate Financing and Investment Decisions and the Weighted Average Cost of Capital, Alfred P. Sloan School of Management Working Paper 598-72, M.I.T.

1. Calculate

$$\rho^* = i(1 - T_c)\,\lambda^* + r^*\,(1 - \lambda_m)$$

where

$$\lambda^* = \frac{D^*}{D^* + E^*}$$

represents the market financial structure for the average firm in that industry. r^* denotes the market required rate of return, as discussed in Chapter II.

2. Use the M-M formula to get to ρ_{02} using ρ^*

$$\rho_{02} = \frac{\rho^*}{(1 - \lambda^* T_c)}$$

This technique is applicable even if assumption (i) does not hold, as long as an appropriate ρ_{02} is used.

Alternatively, ρ_{02} may be obtained by equating the following two equations:

$$V_2 = \frac{\text{EBIT}\,(1 - T_c)}{\rho_{02}} + \frac{I}{i}\,T_c$$

$$V_2 = \frac{EAIT}{r} + \frac{I}{i}$$

This leads to the relationship:

$$\frac{(r - i)\,\rho_{02}}{(r - \rho_{02})\,i} = \frac{EBIT}{I} = \text{times interest earned}$$

from which ρ_{02} is determined to be:

$$\rho_{02} = \frac{\left(\frac{EBIT}{I}\right)\left(\frac{i}{r - i}\right) r}{1 + \left(\frac{EBIT}{I}\right)\left(\frac{i}{r - i}\right)}$$

APPENDIX D

Risk-Equivalent Rate of Return

Tuttle and Litzenberger[1] have proposed a risk-equivalence approach to render any investment project risk-equivalent to the assets of the firm. The procedure consists in compensating for any risk differential by varying the amount of long term borrowing or lending. This is equivalent to determining the method of financing[2] which will allow the firm to preserve the current degree of risk σ_1^* inherent to its returns on equity μ_1^* (denoted r_1 in Section 1 of Chapter III). The risk-equivalent return, which can be computed on this basis for the project, is then compared to the firm's weighted average cost of capital ρ_1 to determine its acceptability or rejectability. The same approach can be used to rank several projects according to their profitability.

When the investment project consists of a prospective acquisition, the appropriate rate of return and risk to use are the acquisition's rate of return on assets μ_2 and the standard error of returns σ_2 inherent to μ_2. The reasons for doing this stem from the fact that the acquirer will be able to modify the present capital structure of the seller to suit his own objectives.

[1] D. L. Tuttle and R. H. Litzenberger, "Leverage, Diversification and Capital Market Effects on a Risk-Adjusted Budgeting Framework", Journal of Finance (June 1968), pp. 427-443.

[2] Only debt and equity (including retained earnings) are considered as possible financing media.

The assumptions which need to be made in order to use the suggested approach are:

i. The leverage of the acquirer is considered ideal for the risk[3] inherent in the present investment mix.

ii. There exists a linear relationship between the firm's expected return (μ_i^*) and estimate of standard error (σ_i^*) of said rate of return.

iii. A perfect market exists in the search for capital, i.e., the firm may borrow and lend at the same rate.

We shall return to these last two assumptions after the approach is described.

<u>Risk-Equivalent Rate of Return</u>[4]

In what follows, we determine the risk-equivalent rate of return for a project and the financing ratio or mix of debt and equity which neutralizes the risk effect of the project on the firm's return to equity.

Let,

μ_2 = expected rate of return on assets from the project.

σ_2 = estimated standard error of the rate of return on assets from the project.

---

[3]Risk is derived from the possibility that the firm's investments might not return the desired yield, and is usually defined in terms of the estimated standard error of returns σ, i.e., as the square root of the mean of the squared deviations of the realized annual returns from the stream of projected returns.

[4]The ideas presented are those of Tuttle and Litzenberger, op. cit. The presentation, however, is our own.

i = before tax lending/borrowing rate

T_c = corporate tax rate

The rate of return on equity μ_2^* and standard error of return σ_2^* of any portfolio consisting of the acquisition candidate's assets and some amount of lending or borrowing may be expressed as:

$$\mu_2^* = \frac{E' + D'}{E'} \mu_2 - \frac{D'}{E'} i (1 - T_c) \qquad \text{(D. 1)}$$

$$\sigma_2^* = \frac{E' + D'}{E'} \sigma_2 \qquad \text{(D. 2)}$$

where E' and D' represent the amounts of equity and debt to finance the acquisition.

In order to neutralize the portfolio's risk, and, therefore, ensure that the acquirer's cost of equity will not vary, we require that:

$$\sigma_2^* = \sigma_1^* \qquad \text{(D. 3)}$$

Replacing σ_2^* by its expression in (D. 2) yields:

$$\frac{E' + D'}{E'} = \frac{\sigma_1^*}{\sigma_2} \qquad \text{(D. 4)}$$

To the extent that the acquiring firm can also be viewed as a portfolio of equity E_1 and debt D_1, we may express σ_1^* in terms of the standard error of returns on assets σ_1 as

$$\sigma_1^* = \frac{E_1 + D_1}{E_1} \sigma_1 \tag{D. 5}$$

Introducing (D. 5) into (D. 4) yields

$$\frac{E' + D'}{E'} = \frac{E_1 + D_1}{E_1} \frac{\sigma_1}{\sigma_2} \tag{D. 6}$$

Since $E' + D'$ represent the total value V_2 of the acquisition candidate, and, therefore, also equal the sum of the market value E_2 of its equity plus the market value D_2 of any outstanding debt, we may determine the financing mix to be:

$$\frac{E'}{E' + D'} = \frac{\sigma_2}{\sigma_1} \frac{E_1}{E_1 + D_1} \tag{D. 7}$$

$$\frac{D'}{E' + D'} = \left(1 - \frac{\sigma_2}{\sigma_1}\right) \frac{E_1}{E_1 + D_1} \tag{D. 8}$$

These equations allow us to deduct the following conclusions:

i. If $\sigma_1 = \sigma_2$, the acquisition should be financed in the same mix as the acquirer's capital structure.

ii. If $\sigma_1 < \sigma_2$, the acquisition should be financed with a higher proportion of equity funds than the average investment of the acquirer.

iii. If $\sigma_1 > \sigma_2$, the acquisition should be financed with more debt than the average investment of the acquirer.

Furthermore, if the acquirer is willing to assume the liabilities of the acquisition, the purchase price is:

$$PRICE2 = E' = E_2 + (D_2 - D') \qquad (D.9)$$

From this equation, we deduct that if:

i. $D' < D_2$, the acquirer will have to retire an amount $D_2 - D'$ of the acquisition's long-term debt D_2.

ii. $D' = D_2$, the acquirer assumes all the acquisition's liabilities.

iii. $D' > D_2$, the acquisition provides an amount of debt capacity equal to $D' - D_2$, which may allow the acquirer to finance part of PRICE2 by issuing debt.

The risk-equivalent rate of return is simply obtained by introducing into (D. 1) the expressions for E' and D':

$$\mu_2^* = \frac{\sigma_1}{\sigma_2} \frac{E_1 + D_1}{E_1} \mu_2 - \left(1 - \frac{\sigma_1}{\sigma_2}\right)* \frac{E_1 + D_1}{E_1} i (1 - T_c)$$

or

$$\mu_2^* = \frac{\sigma_1^*}{\sigma_2} \mu_2 - \left(1 - \frac{\sigma_1^*}{\sigma_2}\right) i (1 - T_c)$$

The following numerical example[5] illustrates how the procedure is used for a case where a firm is confronted with the problem of screening four prospective acquisitions, all of which are independent and perfectly correlated with the firm's assets. Each investment is described by its expected rate of return μ_2 and estimate of standard error of returns σ_2. For the firm, $\mu_1^* = .15$ and $\sigma_1^* = .30$. The after-tax borrowing and lending interest rate i is 5 percent. The risk-adjusted rate of return is then computed as follows:

Company	μ_2	μ_1^*	σ_2	σ_1^*	σ_1^*/σ_2	i	μ_2^*	Decision
A	.40	.15	.60	.30	.50	.05	.225	Accept
B	.12	.15	.25	.30	1.20	.05	.134	Reject
C	.07	.15	.06	.30	5.00	.05	.150	Indifferent
D	.10	.15	.10	.30	3.00	.05	.20	Accept

Critique of the Assumptions

Thus far, we have described and provided examples of the potential uses of the risk-equivalence approach. We recall that at the outset of the description, assumptions were made (i) as to the shape of the risk-return trade-off curve of the firm, and (ii) as to existence of a perfect market for the search of capital. Let us now examine how limiting such assumptions really are. For that purpose, it is useful to make use of risk-return graphs.

The first assumption made states that the relationship between the firm's risk and return is linear (line if). We know, however, that a risk-adverse company requires a geometric rather than an arithmetic increase in the rate of return (μ) as risk (σ) increases. Therefore, the relationship between μ and σ can be represented by curve im. According to this curve, (i) the firm would be indifferent in undertaking any one of two or more companies requiring an equal outlay of equity funds and having a risk-return combination on curve im; (ii) the firm would accept any company whose risk-return combination is under the

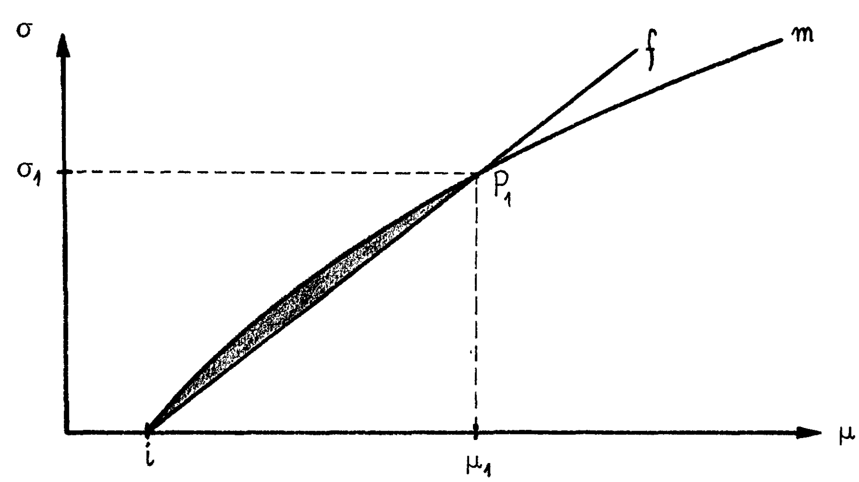

Figure D-1

curve; and (iii) the firm would reject any acquisition candidate displaying a risk-return combination above curve im.

Under the light of this discrepancy, the model fails to provide an adequate risk-equivalent rate of return in only one case, namely; where the company under consideration has a risk-return combination lying inside the shaded area of Figure D-1. As Figure D-2 shows, the risk-equivalent rate of return μ_2^* of a portfolio consisting of any such investment project (point P_2) and a certain amount of borrowing[4] is inferior to μ_1^*. Company 2 is, therefore, classified as rejectable. This counters the criterion provided by curve im. In fact, the acceptance of company 2 would lead to a decrease of the acquirer's cost of equity, and hence to an increase in its market stock price.

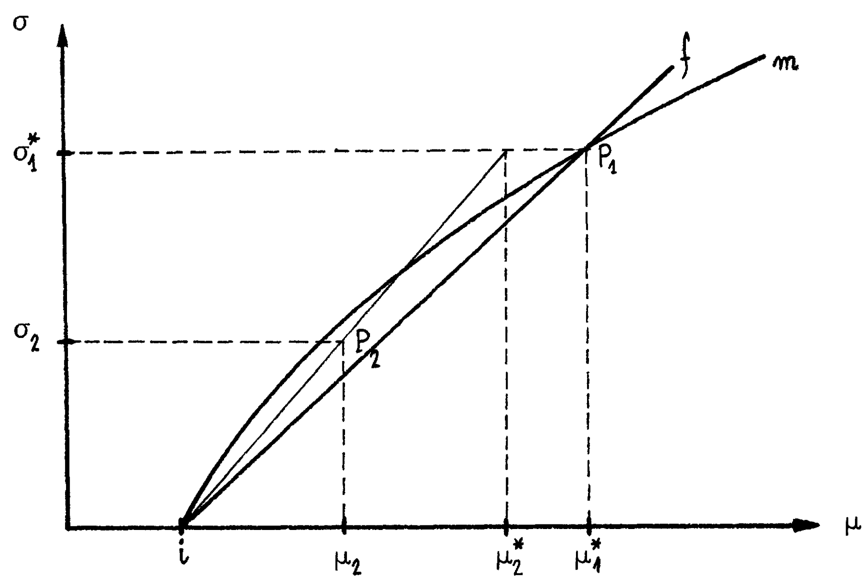

Figure D-2

[4]Because $\sigma_2 < \sigma_1^*$, in order to render Company 2 as risky as the assets of the acquirer it is necessary to finance it mainly by borrowed funds.

The second assumption states that the lending and borrowing rates are equal. This is not always true. We know that depending on the firm's capital structure and the amount of funds needed to be borrowed (to mention only a few factors), the borrowing rate i_B may be higher than the lending rate i_L. The introduction of these two rates into the model results in the model's risk-return trade-off curve becoming a broken line, as $i_B P_1 f$. This in turn, hampers still further the accuracy of the model as a project selection technique because the shaded area becomes larger (Figure D-3). Therefore, the second assumption (i.e., $i_B = i_L$), although seldom true, is, in fact, beneficial to the accuracy of the risk-equivalence approach.

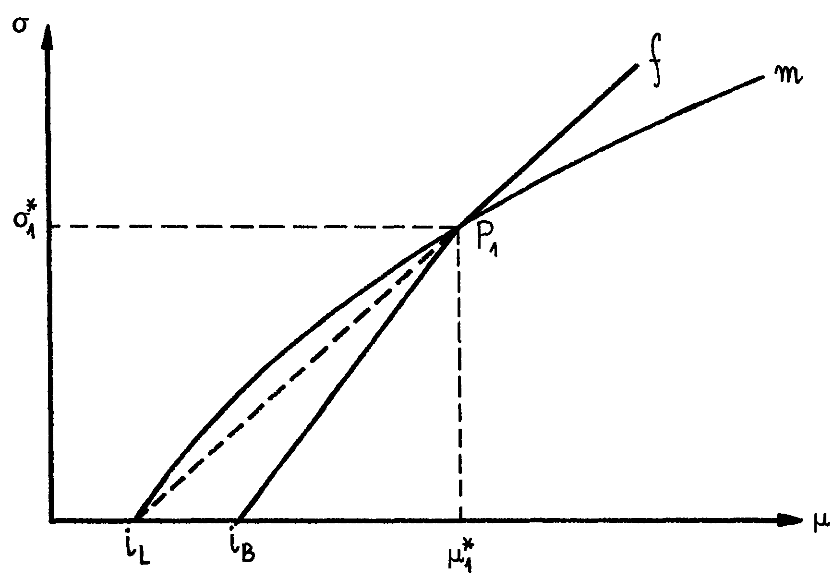

Figure D-3

In conclusion, we can state that the assumptions made by Tuttle and Litzenberger are not overly binding. The approach lends itself usefully to the problem of determining the mix of equity and debt to be used in financing an acquisition whose risk profile differs from that of the acquirer.

APPENDIX E

Alphabetical List of Acronyms Used

ATBIR	=	After-tax-bond-interest-rate
B(t)	=	Oustanding amounts of bonds at the end of year t
BCR	=	Bond conversion rate (no. shares per $100), if any
BIR	=	Bond-interest-rate
BV_i	=	Book value of assets of company i
$C_i(t)$	=	Cash balance of company i at the end of year t
CP(t)	=	Oustanding amount of convertible preferred at end of year t
CPCR	=	Convertible preferred conversion rate (no. shares per $100)
CPD	=	Convertible preferred divident yield
CSI	=	Common stock issued
$D_i(t)$	=	Amount of long-term debt of company i at tl end of year t
DER	=	Debt-to-equity ratio
DIV	=	Projected DPS for company 1
$DPS_i(t)$	=	Divident-per-share of company i for year t
$E_i(t)$	=	Net-earnings of company i during year t
$EPS_i(t)$	=	Earnings-per-share of company i for year t
EPSI(t)	=	Earnings-per-share of company i for year t
$EQ_i(t)$	=	Amount of equity of company i at end of year t
MINOWN	=	Minimum ownership required (%)
NOS_i	=	Number of outstanding shares of company i

P_i	=	Stock price of company i, per share, prior to acquisition
PAYOUT(t)	=	Company 1 dividend payout ratio for year t
PAYO2	=	Payout ratio for company 2
PE_i	=	Price-earnings multiple of company i
PRICE2	=	Price to be paid for the acquisition
$S_i(t)$	=	Sales of company i during year t
SFR	=	Sinking fund requirement (% of initial issue)
TAXR	=	Corporate tax rate
t_p	=	Initial year for sinking fund payments
V_i	=	Value of company i
$WC_i(t)$	=	Net-working-capital balance at the end of year t

APPENDIX F

The QUICKSCAN II Program

This appendix presents the program listing (FORTRAN IV) and a few sample output pages of our own version of QUICKSCAN (presented in Section B. 2 of Chapter VIII). The data used is the same as that used for the sample run of FUSION.

```
DCS FORTRAN IV 360N-FO-479 3-4          MAINPGM          DATE   14/06/72      TIME     12.08.01        PAGE 0001

0001                DIMENSION EPS1(10),EPS2(10),EPS3(10),E1(10),E2(10),E3(10),PE(10)
0002                REAL LOWPR,NE2,NSHR2
0003                INTEGER PY,PR1
0004                NAMELIST/FIRM1/SP1,NOS1,E1
0005                NAMELIST/FIRM2/SP2,NOS2,E2
0006                NAMELIST/CONTRL/LOWPR,HIPR,DPR,TAXR,BIR,PY,FDPR,PE
0007                PR1=3
              C---READ AND ECHO PRINT
0008          10    READ(1,FIRM1)
0009                READ(1,FIRM2)
0010                READ(1,CONTRL)
0011                WRITE(PR1,15)
0012          15    FORMAT('1')
0013                WRITE(PR1,FIRM1)
0014                WRITE(PR1,FIRM2)
0015                WRITE(PR1,CONTRL)
0016                EPSA=E1(PY)/NOS1
0017                EPSB=E2(PY)/NOS2
0018                LPR=HIPR+LOWPR+.5
0019                IPR=DPR+.5
              C
              C---CONSIDER DIFFERENT PREMIUMS
0020                DO 1000 I=0,LPR,IPR
0021                LINE=0
0022                PREM=I-LOWPR
0023                P=1.+(PREM/100.)
0024                VALUE2=SP2*NOS2*P
              C---PRINT HEADING
0025                WRITE(PR1,20) EPSA,EPSB,SP1
0026          20    FORMAT('1PREMERGER EPS -- PARENT',10X,'$',F7.2
                   1/       ' PREMERGER EPS -- ACQUIRED',8X,'$',F7.2
                   2/       ' PREMERGER STOCK PRICE -- PARENT  $',F7.2)
0027                WRITE(PR1,30) VALUE2,PREM
0028          30    FORMAT(/' PRICE OF ACQUIRED FIRM --    $',F10.0
                   1/        ' PREMIUM PAID',23X,F5.1,'%')
0029                WRITE(PR1,60)
0030          60    FORMAT(//9X,'BONDS       BOND          TO BUY COMPANY            COMBIN
                   1ED        PER       NEW      EPS      ACQUIRED STOCKHOLDERS',
                   2/9X,'% OF        ISSUE            MUST ISSUE               INCOME
                   3CENT     EPS    DILUTION      GET PER OLD SHARE',
                   4/9X,'PRICE',55X,'OWNED',29X,'NEW     CASH',
                   5/' LINE',28X,'SHARES        VALUE',46X,'EPS     SHARE      FLOW')
              C
              C---CONSIDER SEVERAL BOND PERCENTAGES
0031                DO 900 J=0,100,10
0032                WRITE(PR1,70)
0033          70    FORMAT(/)
0034                LINE=LINE+1
0035                BONDS=VALUE2*(J/100.)
0036                STOCK=VALUE2-BONDS
0037                RNEWSH=(STOCK/SP1)
0038                NEWSH=RNEWSH+.5
0039                PCOWN=NOS1*100./(NOS1+NEWSH)
0040                E3(PY)=E1(PY)+E2(PY)-(BIR*BONDS*(1.-TAXR))
```

```
DCS FORTRAN IV 360N-FO-479 3-4          MAINPGM           DATE   14/06/72      TIME     12.08.01        PAGE 0002

0041              EPS3(PY)=E3(PY)/(NOS1+NEWSH)
0042              EPS1(PY)=E1(PY)/NOS1
0043              DILUTE=((EPS3(PY)/EPS1(PY))*100.)-100.
            C
            C---FIRM 2 SHAREHOLDERS GET PER OLD SHARE
0044              NSHR2=RNEWSH/(NOS2*1.)
0045              NE2=EPS3(PY)*NSHR2
0046              CSHFL2=NE2*FDPR+SP2*P*(J/100.)*BIR
            C
            C---AFTER MERGER STOCK PRICE
0047              OPTSP3=EPS3(PY)*PE(1)
0048              MIDSP3=EPS3(PY)*PE(2)
0049              PESSP3=EPS3(PY)*PE(3)
0050              WRITE(PR1,200)LINE,J,BONDS,NEWSH,STOCK,E3(PY),PCOWN,EPS3(PY),DILUT
                 1E,NE2,NSHR2,CSHFL2
0051        200   FORMAT(I4,4X,I3,'.00%    $',F10.0,3X,I7,'    $',F10.0,'   $',F10.0,
                 1F8.2,'% $',F6.2,F7.2,'%    $',F5.2,F6.3,'    $',F6.2)
0052        900   CONTINUE
0053        1000  CONTINUE
0054              GO TO 10
0055              END
```

```
&FIRM1
SP1=  85.209991    ,NOS1=    9220000.,E1=  49400000.    , 0.12729910E-79, 0.77697234E-80, 0.88208547E-80, 0.78850287E-80, 0.81352000E
 0.79334158E-80, 0.79735667E-80, 0.80137177E-80, 0.80538686E-80
&END
&FIRM2
SP2=  58.750000    ,NOS2=    3560000.,E2=  11200000.    , 0.81341705E-80, 0.81650558E-80, 0.82587414E-80, 0.83524269E-80, 0.84461125E
 0.85397980E-80, 0.86334836E-80, 0.87271691E-80, 0.91822132E-80
&END
&CONTRL
LOWPR=  10.000000    ,HIPR=  10.000000    ,DPR=  5.0000000    ,TAXR= 0.47999996    ,BIR= 0.59999999E-01,PY=          1,FDPR= 0.39999
  14.000000    ,  16.000000    ,  18.000000    , 0.11110488E-79, 0.12190446E-79, 0.11151669E-79, 0.11152698E-79, 0.11193879E-79, 0.1
 0.11236089E-79
&END
```

PREMERGER EPS -- PARENT $ 5.36
PREMERGER EPS -- ACQUIRED $ 3.15
PREMERGER STOCK PRICE -- PARENT $ 85.21

PRICE OF ACQUIRED FIRM -- $188234992.
PREMIUM PAID -10.0%

LINE	BONDS % OF PRICE	BOND ISSUE	TO BUY COMPANY MUST ISSUE SHARES	VALUE	COMBINED INCOME	PER CENT OWNED	NEW EPS	EPS DILUTION	ACQUIRED STOCKHOLDERS GET PER OLD SHARE EPS	NEW SHARE	CASH FLOW
1	0.00%	$ 0.	2209071	$188234992.	$ 60600000.	80.67%	$ 5.30	-1.04%	$ 3.29	0.621	$ 1.32
2	10.00%	$ 18823488.	1988164	$169411504.	$ 60012704.	82.26%	$ 5.35	-0.07%	$ 2.99	0.558	$ 1.51
3	20.00%	$ 37646992.	1767257	$150588000.	$ 59425408.	83.92%	$ 5.41	0.95%	$ 2.68	0.496	$ 1.71
4	30.00%	$ 56470480.	1546350	$131764512.	$ 58838112.	85.64%	$ 5.47	2.00%	$ 2.37	0.434	$ 1.90
5	40.00%	$ 75293984.	1325443	$112941008.	$ 58250816.	87.43%	$ 5.52	3.10%	$ 2.06	0.372	$ 2.09
6	50.00%	$ 94117488.	1104536	$ 94117504.	$ 57663520.	89.30%	$ 5.59	4.24%	$ 1.73	0.310	$ 2.28
7	60.00%	$112940976.	883629	$ 75294016.	$ 57076240.	91.25%	$ 5.65	5.43%	$ 1.40	0.248	$ 2.46
8	70.00%	$131764480.	662722	$ 56470512.	$ 56488944.	93.29%	$ 5.72	6.68%	$ 1.06	0.186	$ 2.65
9	80.00%	$150587984.	441814	$ 37647008.	$ 55901648.	95.43%	$ 5.79	7.99%	$ 0.72	0.124	$ 2.83
10	90.00%	$169411488.	220907	$ 18823504.	$ 55314352.	97.66%	$ 5.86	9.35%	$ 0.36	0.062	$ 3.00
11	100.00%	$188234992.	0	$ 0.	$ 54727056.	100.00%	$ 5.94	10.78%	$ 0.0	0.0	$ 3.17

PREMERGER EPS -- PARENT $ 5.36
PREMERGER EPS -- ACQUIRED $ 3.15
PREMERGER STOCK PRICE -- PARENT $ 85.21

PRICE OF ACQUIRED FIRM -- $198692496.
PREMIUM PAID -5.0%

LINE	BONDS % OF PRICE	BOND ISSUE	TO BUY COMPANY MUST ISSUE SHARES	VALUE	COMBINED INCOME	PER CENT OWNED	NEW EPS	EPS DILUTION	ACQUIRED STOCKHOLDERS GET PER OLD SHARE EPS	NEW SHARE	CASH FLOW
1	0.00%	$ 0.	2331798	$198692496.	$ 60600000.	79.81%	$ 5.25	-2.09%	$ 3.44	0.655	$ 1.37
2	10.00%	$ 19869232.	2098618	$178823264.	$ 59980080.	81.46%	$ 5.30	-1.10%	$ 3.12	0.589	$ 1.58
3	20.00%	$ 39738496.	1865438	$158954000.	$ 59360160.	83.17%	$ 5.35	-0.06%	$ 2.81	0.524	$ 1.79
4	30.00%	$ 59607728.	1632258	$139084768.	$ 58740240.	84.96%	$ 5.41	1.02%	$ 2.48	0.458	$ 2.00
5	40.00%	$ 79476992.	1399078	$119215504.	$ 58120304.	86.82%	$ 5.47	2.15%	$ 2.15	0.393	$ 2.20
6	50.00%	$ 99346240.	1165899	$ 99346256.	$ 57500384.	88.77%	$ 5.54	3.33%	$ 1.81	0.327	$ 2.40
7	60.00%	$119215488.	932719	$ 79477008.	$ 56880464.	90.81%	$ 5.60	4.56%	$ 1.47	0.262	$ 2.60
8	70.00%	$139084736.	699540	$ 59607760.	$ 56260544.	92.95%	$ 5.67	5.86%	$ 1.11	0.196	$ 2.79
9	80.00%	$158953984.	466360	$ 39738512.	$ 55640624.	95.19%	$ 5.74	7.21%	$ 0.75	0.131	$ 2.98
10	90.00%	$178823232.	233180	$ 19869264.	$ 55020704.	97.53%	$ 5.82	8.63%	$ 0.38	0.065	$ 3.17
11	100.00%	$198692496.	0	$ 0.	$ 54400784.	100.00%	$ 5.90	10.12%	$ 0.0	0.0	$ 3.35

PREMERGER EPS -- PARENT $ 5.36
PREMERGER EPS -- ACQUIRED $ 3.15
PREMERGER STOCK PRICE -- PARENT $ 85.21

PRICE OF ACQUIRED FIRM -- $209150000.
PREMIUM PAID 0.0%

LINE	BONDS % OF PRICE	BOND ISSUE	TO BUY COMPANY MUST ISSUE SHARES	VALUE	COMBINED INCOME	PER CENT OWNED	NEW EPS	EPS DILUTION	ACQUIRED STOCKHOLDERS GET PER OLD SHARE EPS	NEW SHARE	CASH FLOW
1	0.00%	$ 0.	2454524	$209150000.	$ 60600000.	78.98%	$ 5.19	-3.12%	$ 3.58	0.689	$ 1.43
2	10.00%	$ 20914992.	2209072	$188235008.	$ 59947440.	80.67%	$ 5.25	-2.10%	$ 3.25	0.621	$ 1.65
3	20.00%	$ 41829984.	1963619	$167320016.	$ 59294896.	82.44%	$ 5.30	-1.04%	$ 2.92	0.552	$ 1.87
4	30.00%	$ 62744976.	1718167	$146405024.	$ 58642352.	84.29%	$ 5.36	0.06%	$ 2.59	0.483	$ 2.09
5	40.00%	$ 83659984.	1472714	$125490016.	$ 57989808.	86.23%	$ 5.42	1.22%	$ 2.24	0.414	$ 2.31
6	50.00%	$104574992.	1227262	$104575008.	$ 57337248.	88.25%	$ 5.49	2.43%	$ 1.89	0.345	$ 2.52
7	60.00%	$125489984.	981810	$ 83660016.	$ 56684704.	90.38%	$ 5.56	3.70%	$ 1.53	0.276	$ 2.73
8	70.00%	$146404992.	736357	$ 62745008.	$ 56032160.	92.60%	$ 5.63	5.04%	$ 1.16	0.207	$ 2.93
9	80.00%	$167319984.	490905	$ 41830016.	$ 55379616.	94.94%	$ 5.70	6.44%	$ 0.79	0.138	$ 3.13
10	90.00%	$188234992.	245453	$ 20915008.	$ 54727056.	97.41%	$ 5.78	7.91%	$ 0.40	0.069	$ 3.33
11	100.00%	$209150000.	0	$ 0.	$ 54074512.	100.00%	$ 5.86	9.46%	$ 0.0	0.0	$ 3.52

PREMERGER EPS -- PARENT $ 5.36
PREMERGER EPS -- ACQUIRED $ 3.15
PREMERGER STOCK PRICE -- PARENT $ 85.21

PRICE OF ACQUIRED FIRM -- $219607328.
PREMIUM PAID 5.0%

LINE	BONDS % OF PRICE	BOND ISSUE	TO BUY COMPANY MUST ISSUE SHARES	TO BUY COMPANY MUST ISSUE VALUE	COMBINED INCOME	PER CENT OWNED	NEW EPS	EPS DILUTION	ACQUIRED STOCKHOLDERS GET PER OLD SHARE EPS	NEW SHARE	CASH FLOW
1	0.00%	$ 0.	2577248	$219607328.	$ 60600000.	78.15%	$ 5.14	-4.13%	$ 3.72	0.724	$ 1.49
2	10.00%	$ 21960720.	2319523	$197646608.	$ 59914816.	79.90%	$ 5.19	-3.09%	$ 3.38	0.652	$ 1.72
3	20.00%	$ 43921456.	2061798	$175685872.	$ 59229648.	81.72%	$ 5.25	-2.01%	$ 3.04	0.579	$ 1.96
4	30.00%	$ 65882176.	1804074	$153725152.	$ 58544464.	83.64%	$ 5.31	-0.88%	$ 2.69	0.507	$ 2.19
5	40.00%	$ 87842912.	1546349	$131764416.	$ 57859296.	85.64%	$ 5.37	0.30%	$ 2.33	0.434	$ 2.41
6	50.00%	$109803664.	1288624	$109803664.	$ 57174112.	87.74%	$ 5.44	1.54%	$ 1.97	0.362	$ 2.64
7	60.00%	$131764384.	1030900	$ 87842944.	$ 56488944.	89.94%	$ 5.51	2.85%	$ 1.60	0.290	$ 2.86
8	70.00%	$153725120.	773175	$ 65882208.	$ 55803776.	92.26%	$ 5.58	4.22%	$ 1.21	0.217	$ 3.08
9	80.00%	$175685840.	515450	$ 43921488.	$ 55118592.	94.71%	$ 5.66	5.67%	$ 0.82	0.145	$ 3.29
10	90.00%	$197646576.	257725	$ 21960752.	$ 54433424.	97.28%	$ 5.74	7.19%	$ 0.42	0.072	$ 3.50
11	100.00%	$219607328.	0	$ 0.	$ 53748240.	100.00%	$ 5.83	8.80%	$ 0.0	0.0	$ 3.70

PREMERGER EPS -- PARENT $ 5.36
PREMERGER EPS -- ACQUIRED $ 3.15
PREMERGER STOCK PRICE -- PARENT $ 85.21

PRICE OF ACQUIRED FIRM -- $230064880.
PREMIUM PAID 10.0%

LINE	BONDS % OF PRICE	BOND ISSUE	TO BUY COMPANY MUST ISSUE SHARES	TO BUY COMPANY MUST ISSUE VALUE	COMBINED INCOME	PER CENT OWNED	NEW EPS	EPS DILUTION	ACQUIRED STOCKHOLDERS GET PER OLD SHARE EPS	NEW SHARE	CASH FLOW
1	0.00%	$ 0.	2699975	$230064880.	$ 60600000.	77.35%	$ 5.08	-5.11%	$ 3.86	0.758	$ 1.54
2	10.00%	$ 23006464.	2429978	$207058416.	$ 59882192.	79.14%	$ 5.14	-4.07%	$ 3.51	0.683	$ 1.79
3	20.00%	$ 46012960.	2159980	$184051920.	$ 59164384.	81.02%	$ 5.20	-2.97%	$ 3.15	0.607	$ 2.04
4	30.00%	$ 69019440.	1889983	$161045440.	$ 58446592.	82.99%	$ 5.26	-1.81%	$ 2.79	0.531	$ 2.28
5	40.00%	$ 92025936.	1619985	$138038944.	$ 57728784.	85.06%	$ 5.33	-0.60%	$ 2.42	0.455	$ 2.52
6	50.00%	$115032432.	1349987	$115032448.	$ 57010976.	87.23%	$ 5.39	0.67%	$ 2.05	0.379	$ 2.76
7	60.00%	$138038912.	1079990	$ 92025968.	$ 56293184.	89.51%	$ 5.47	2.01%	$ 1.66	0.303	$ 2.99
8	70.00%	$161045408.	809993	$ 69019472.	$ 55575376.	91.92%	$ 5.54	3.42%	$ 1.26	0.228	$ 3.22
9	80.00%	$184051888.	539995	$ 46012992.	$ 54857568.	94.47%	$ 5.62	4.90%	$ 0.85	0.152	$ 3.44
10	90.00%	$207058384.	269998	$ 23006496.	$ 54139776.	97.15%	$ 5.70	6.48%	$ 0.43	0.076	$ 3.66
11	100.00%	$230064880.	0	$ 0.	$ 53421968.	100.00%	$ 5.79	8.14%	$ 0.0	0.0	$ 3.88

APPENDIX G

A Sample Session Using FUSION

In what follows, we present a sample session using FUSION. Insofar as the questions are self-explanatory, we shall not comment on them. User's responses are typed on the line following each question.

As may be observed, the user may, before inputting any required information, type "list" or simply "l" to have the program display the values that had been used in the previous run. If he wishes to reuse the same values, he must simply type a slash (/). If he wishes to insert his comments in between any input vales, he can do so by typing a semicolon, inserting his comments, and continuing to enter data in the next line. These comments become clear in the following pages.

To avoid many of the problems we encountered initially with the package determinator subroutine, we recommend the user first use the program by specifying the proportions of securities to be used in the package. The results thus obtained will provide him with the insight of possible values that the various variables may assume and which is required to efficiently use the package determinator subroutine.

```
***************************** FUSION PROGRAM *****************************

DO YOU WISH THE USER INSTRUCTIONS TO BE PRINTED ?
yes

*** USER CONTROL INSTRUCTIONS ***
  IN RESPONSE TO THE PROGRAM QUESTION 'WHAT NOW?' YOU HAVE THE OPTION OF
  SPECIFYING WHAT YOU WISH TO DO NEXT BY ENTERING IN ASCENDING ORDER ANY OF
  THE FOLLOWING DIGITS:

          0 = EXIT - END COMPUTATIONS
          1 = CHANGE COMPANY 1 RELATED DATA
          2 = CHANGE COMPANY 2 RELATED DATA
          3 = CHANGE PREMIUM
          4 = CHANGE THE TYPES OF SECURITIES USED IN PACKAGE
          5 = CHANGE BOND FEATURES
          6 = CHANGE CONVERTIBLE PREF. FEATURES
          7 = CHANGE PROPORTIONS OF SECURITIES USED
          8 = USE PACKAGE DETERMINATOR

  MARK THE END OF YOUR ENTRIES BY TYPING A SLASH (/).

SPECIFY WHAT YEAR IT IS AND THE NUMBER OF PAST YEARS BEING ANALYZED.
1972 5

DO YOU WISH TO ENTER YOUR OWN DATA FOR COMPANY 1 ?
yes
```

```
SPECIFY THE EARNINGS OF FIRM 1 FOR YEARS  1967, 1968, 1969, 1970, 1971,
1972,
list the standard input values
  30700.000   33750.000   37100.000   40800.000   44900.000   49400.000
?
/ use these values

ENTER THE FOLLOWING DATA:
    1. SHARE PRICE
    2. NUMBER OF OUTSTANDING SHARES
    3. DIVIDEND PAYOUT RATIO (%)
list standard values
     85.210    9220.000       0.400
/ use same

    4. TOTAL LONG-TERM DEBT OUTSTANDING
list
 500000.000
/

    5. WORKING CAPITAL
l  ; 'l' is the abbreviation of 'list'
  50000.000
/ use same

    6. BOOK VALUE OF EQUITY
list
 500000.000
/
```

```
DO YOU WISH TO ENTER YOUR OWN DATA FOR COMPANY 2 ?
yes

SPECIFY THE EARNINGS OF FIRM 2 FOR YEARS  1967, 1968, 1969, 1970, 1971,
1972,
list
   5600.000    6400.000    7400.000    8500.000    9700.000   11200.000
?
/ use same

ENTER THE FOLLOWING DATA:
    1. SHARE PRICE
    2. NUMBER OF OUTSTANDING SHARES
    3. DIVIDEND PAYOUT RATIO (%)
1
     58.750    3560.000       0.500
/

    4. TOTAL LONG-TERM DEBT OUTSTANDING
1
  50000.000
/

    5. WORKING CAPITAL
1
   3000.000
/

    6. BOOK VALUE OF EQUITY
list
  50000.000
/
```

************************ PRE-ACQUISITION DATA ************************

YEAR	EARNINGS 1	EARNINGS 2
1967	$30700.	$ 5600.
1968	$33750.	$ 6400.
1969	$37100.	$ 7400.
1970	$40800.	$ 8500.
1971	$44900.	$ 9700.
1972	$49400.	$11200.

DO YOU WISH TREND ANALYSIS TO BE PERFORMED ?
no

***************************** CURRENT YEAR DATA *****************************

	SHARES (000'S)	STOCK PRICE	EPS	DPS	P/E	GROWTH RATE
COMPANY 1	9220.	$ 85.21	$ 5.36	$ 2.14	15.9	0.10
COMPANY 2	3560.	$ 58.75	$ 3.15	$ 1.57	18.7	0.15

************************** ESTIMATED FUTURE DATA **************************

YEAR	EARNINGS 1	EARNINGS 2	DEBT 1	DEBT 2	EQUITY 1	EQUITY 2	EPS 1	EPS 2
1972	$ 49400.	$ 11200.	$500000.	$ 50000.	$500000.	$ 50000.	$ 5.36	$ 3.15
1973	$ 54340.	$ 12880.	$532604.	$ 56440.	$532604.	$ 56440.	$ 5.89	$ 3.62
1974	$ 59774.	$ 14812.	$535864.	$ 57406.	$535864.	$ 57406.	$ 6.48	$ 4.16
1975	$ 65751.	$ 17034.	$539451.	$ 58517.	$539451.	$ 58517.	$ 7.13	$ 4.78
1976	$ 72326.	$ 19589.	$543396.	$ 59794.	$543396.	$ 59794.	$ 7.84	$ 5.50

```
SPECIFY THE PREMIUM TO BE PAID FOR THE ACQUISITION.
0%

PRICE2 = $  209150.
EXCHANGE RATIO = 1.450

SPECIFY AMOUNT TO BE PAID WITH CASH (000'S).
0

PRICE2 = $  209150.
EXCHANGE RATIO = 1.450

OK ?
yes

INDICATE TYPE(S) OF SECURITIES TO BE USED IN PACKAGE
BY ENTERING A 0 OR 1 FOR: COMMON STOCK,BONDS,CONVERTIBLE PREFERRED.
1 1 0

SPECIFY THE B4-TAX-INTEREST-RATE, AND THE
ANNUAL PERCENTAGE SINKING FUND REQUIREMENT.
6% 0%

IF YOU WISH TO SPECIFY THE RELATIVE PROPORTION OF BONDS
AND/OR CONVERTIBLE PREFERRED ?  TYPE 0
IF YOU PREFER TO HAVE THE PROGRAM DETERMINE THESE PROPORTIONS
BASED ON YOUR GOALS, TYPE 1.
0
```

```
SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH BONDS.
0%

********************************* MERGER DATA ********************************

         PREMIUM =    0.0 %
         PRICE (000'S)    $  209149.9
         ADJUSTED PRICE (000'S)    $  209149.9


********************************* PACKAGE DATA *******************************

                             VALUE      FRACTION    INT/DIV    SINKING
                             (000'S)                 RATE     FUND REQ.
          COMMON STOCK      $209149.9     1.000
          CONVERTIBLE PREF. $      0.0    0.0        0.0
          BONDS             $      0.0    0.0        0.06          0.0
          CASH              $      0.0    0.0

PRINT POSTMERGER YEAR-END RESULTS ?
yes

***************************** POSTMERGER DATA ********* *********************
                     1973          1974          1975          1976
 EARNINGS 000'S $ 67219.94    $ 74585.87    $ 82785.00    $ 91915.12    $
 EPS            $     5.76    $     6.39    $     7.09    $     7.87    $
 DPS            $     2.30    $     2.56    $     2.84    $     3.15    $
 EPSI           $     5.25    $     6.04    $     6.94    $     7.98    $
 EPSDIL               2.30%         1.45%         0.56%        -0.37%
 OWNERSHIP           78.98%        78.98%        78.98%        78.98%
 SHARES              11674.        11674.        11674.        11674.
 DEBT/EQUITY          0.79          0.80          0.80          0.80

WHAT NOW?
7 / let's examine the case where 50% of package are bonds
```

```
SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH BONDS.
50%

******************************** MERGER DATA ********************************

        PREMIUM =    0.0 %
        PRICE (000'S)    $  209149.9
        ADJUSTED PRICE (000'S)    $  209149.9


******************************** PACKAGE DATA *******************************

                             VALUE       FRACTION    INT/DIV     SINKING
                             (000'S)                 RATE        FUND REQ.
        COMMON STOCK        $104575.0     0.500
        CONVERTIBLE PREF.   $     0.0     0.0        0.0
        BONDS               $104574.9     0.500      0.06          0.0
        CASH                $     0.0     0.000


PRINT POSTMERGER YEAR-END RESULTS ?
yes

*************************** POSTMERGER DATA ********* ********************
                   1973          1974          1975          1976
 EARNINGS 000'S $ 63957.20    $ 71323.12    $ 79522.25    $ 88652.37    $
 EPS            $     6.12    $     6.83    $     7.61    $     8.49    $
 DPS            $     2.45    $     2.73    $     3.04    $     3.39    $
 EPSI           $    10.50    $    12.07    $    13.88    $    15.96    $
 EPSDIL             -3.87%        -5.31%        -6.74%        -8.18%
 OWNERSHIP          88.25%        88.25%        88.25%        88.25%
 SHARES             10447.        10447.        10447.        10447.
 DEBT/EQUITY         1.09          1.09          1.09          1.09

WHAT NOW?
7 / let's examine next the case of an all-bond package
```

```
SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH BONDS.
100%

******************************** MERGER DATA ********************************

         PREMIUM =    0.0 %
         PRICE (000'S)    $  209149.9
         ADJUSTED PRICE (000'S)   $  209149.9


******************************** PACKAGE DATA ********************************

                               VALUE      FRACTION    INT/DIV    SINKING
                               (000'S)                RATE      FUND REQ.
          COMMON STOCK      $       0.0      0.0
          CONVERTIBLE PREF. $       0.0      0.0       0.0
          BONDS             $209149.9        1.000     0.06          0.0
          CASH              $       0.0      0.0


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* ********************
                       1973          1974          1975          1976
 EARNINGS 000'S $ 60694.46    $ 68060.37    $ 76259.50    $ 85389.62    $
 EPS            $      6.58   $      7.38   $      8.27   $      9.26   $
 DPS            $      2.63   $      2.95   $      3.31   $      3.70   $
 EPSI           $*********    $*********    $*********    $*********    $
 EPSDIL             -11.69%       -13.86%       -15.98%       -18.06%
 OWNERSHIP          100.00%       100.00%       100.00%       100.00%
 SHARES               9220.         9220.         9220.         9220.
 DEBT/EQUITY           1.50          1.50          1.50          1.49

WHAT NOW?
4 / let's use convertible preferreds in the package
```

```
SPECIFY AMOUNT TO BE PAID WITH CASH (000'S).
0

INDICATE TYPE(S) OF SECURITIES TO BE USED IN PACKAGE
BY ENTERING A 0 OR 1 FOR: COMMON STOCK,BONDS,CONVERTIBLE PREFERRED.
1 1 1

SPECIFY THE CONVERTIBLE PREFERRED DIVIDEND YIELD,
AND CONVERSION RATIO.
5% ; rate is lower than for bonds because of conversion feature.
5%
1.0% ; conversion is set at 1 share of common for each $100. of preferred.

SPECIFY YOUR ESTIMATE OF WHAT PERCENTAGE OF THE TOTAL CONVERTIBLE PREFERRED
ISSUE WILL BE CONVERTED BY THE ENDS OF YEARS 1973 THRU 1976
0% 5% 40% 100%

SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH BONDS.
0%

SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH CONVERTIBLE PREFERREDS.
100%
```

```
******************************** MERGER DATA ********************************

         PREMIUM =    0.0 %
         PRICE (000'S)    $  209149.9
         ADJUSTED PRICE (000'S)    $  209149.9


******************************** PACKAGE DATA *******************************

                                VALUE       FRACTION   INT/DIV    SINKING
                                (000'S)                RATE       FUND REQ.
          COMMON STOCK      $      0.0       0.0
          CONVERTIBLE PREF. $209149.9        1.000     0.05
          BONDS             $      0.0       0.0       0.06          0.0
          CASH              $      0.0       0.0


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* ********************
                         1973         1974          1975          1976
 EARNINGS 000'S $ 56762.44   $ 64128.38   $ 72850.37   $ 85640.62   $
 EPS            $     6.16   $     6.96   $     7.81   $     8.52   $
 DPS            $     2.46   $     2.78   $     3.[illegible]3   $     3.41   $
 EPSI           $*********   $*********   $   162.89   $    23.41   $
 EPSDIL             -4.46%       -7.28%       -9.55%       -8.56%
 OWNERSHIP         100.00%      100.00%       98.88%       91.68%
 SHARES              9220.        9220.        9525.       10057.
 DEBT/EQUITY          0.79         0.80         0.80         0.80

WHAT NOW?
7 / let's examine a case where each type of security enters the package in 33.0%
```

```
SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH BONDS.
33.33%

SPECIFY THE FRACTION OF THE PACKAGE TO BE PAID WITH CONVERTIBLE PREFERREDS.
33.33%

******************************** MERGER DATA ********************************

        PREMIUM =    0.0 %
        PRICE (000'S)    $  209149.9
        ADJUSTED PRICE (000'S)    $  209149.9


******************************** PACKAGE DATA ********************************

                            VALUE      FRACTION   INT/DIV    SINKING
                            (000'S)               RATE      FUND REQ.
        COMMON STOCK       $ 69730.7    0.333
        CONVERTIBLE PREF.  $ 69709.6    0.333      0.05
        BONDS              $ 69709.6    0.333      0.06        0.0
        CASH               $     0.0    0.000

PRINT POSTMERGER YEAR-END RESULTS ?
yes
```

```
**************************** POSTMERGER DATA ********* ********************
                     1973          1974          1975          1976
 EARNINGS 000'S $ 61559.52    $ 68925.44    $ 77298.81    $ 87648.87    $
 EPS            $     6.13    $     6.87    $     7.67    $     8.50    $
 DPS            $     2.45    $     2.75    $     3.07    $     3.40    $
 EPSI           $    15.75    $    18.11    $    19.97    $    17.86    $
 EPSDIL             -4.05%        -5.91%        -7.61%        -8.30%
 OWNERSHIP          91.85%        91.85%        91.53%        89.37%
 SHARES             10038.        10038.        10073.        10317.
 DEBT/EQUITY         0.98          0.98          0.98          0.99

WHAT NOW?
6 ; let's change the dividend yield on the preferred
6
8 ; activate the package determinator
8
 /

SPECIFY THE CONVERTIBLE PREFERRED DIVIDEND YIELD,
AND CONVERSION RATIO.
8% 1.0%

SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
1 1

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
0% 1 0

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
90.00% 0 5
```

```
SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
1. 20% 6%

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
50000. 0 8%

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
yes

ITERATION #: 0      COST = $       0.0

 0        0.0     0.0      0.0      0.0      1.000    1.000    0.0      1.000
                  0.0      4.050    0.200    0.060    0.0      0.080

 0   209149.94    1.000    1.000    1.000    1.000   -1.000    0.0      0.0
                  0.0      0.0      0.0      0.0      0.0      0.0

 0    12879.99    0.069    0.031    0.080    0.0      0.0      1.000   -1.000
                  0.0      0.0      0.0      0.0      0.0      0.0

 0     1024.44    0.012    0.0      0.0      0.0      0.0      0.0      0.0
                  1.000   -1.000    0.0      0.0      0.0      0.0

 0    56439.94    1.000   -1.000    1.000    0.0      0.0      0.0      0.0
                  0.0      0.0      1.000   -1.000    0.0      0.0

 0    48483.81    0.028    0.031    0.080    0.0      0.0      0.0      0.0
                  0.0      0.0      0.0      0.0      1.000   -1.000
```

ITERATION #: 1 COST = $ 220437.875

0	-220437.87	-1.200	-0.800	-1.200	0.0	2.000	0.0	1.000
		0.0	4.050	0.0	0.260	0.0	0.080	
4	209149.94	1.000	1.000	1.000	1.000	-1.000	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	
6	12879.99	0.069	0.031	0.080	0.0	0.0	1.000	-1.000
		0.0	0.0	0.0	0.0	0.0	0.0	
8	1024.44	0.012	0.0	0.0	0.0	0.0	0.0	0.0
		1.000	-1.000	0.0	0.0	0.0	0.0	
10	56439.94	1.000	-1.000	1.000	0.0	0.0	0.0	0.0
		0.0	0.0	1.000	-1.000	0.0	0.0	
12	48483.81	0.028	0.031	0.080	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	1.000	-1.000	

ITERATION #: 2 COST = $ 152710.000

0	-152710.00	0.0	-2.000	0.0	0.0	2.000	0.0	1.000
		0.0	4.050	1.200	-0.940	0.0	0.080	
4	152710.00	0.0	2.000	0.0	1.000	-1.000	0.0	0.0
		0.0	0.0	-1.000	1.000	0.0	0.0	
6	8976.22	0.0	0.100	0.011	0.0	0.0	1.000	-1.000
		0.0	0.0	-0.069	0.069	0.0	0.0	
8	362.08	0.0	0.012	-0.012	0.0	0.0	0.0	0.0
		1.000	-1.000	-0.012	0.012	0.0	0.0	
1	56439.94	1.000	-1.000	1.000	0.0	0.0	0.0	0.0
		0.0	0.0	1.000	-1.000	0.0	0.0	
12	46922.30	0.0	0.059	0.052	0.0	0.0	0.0	0.0
		0.0	0.0	-0.028	0.028	1.000	-1.000	

ITERATION #: 3 COST = $ 91004.000

0	-91004.00	0.0	0.0	-2.000	0.0	2.000	0.0	1.000
		170.420	-166.370	-0.800	1.060	0.0	0.080	
4	91004.00	0.0	0.0	2.000	1.000	-1.000	0.0	0.0
		-170.420	170.420	1.000	-1.000	0.0	0.0	
6	5879.61	0.0	0.0	0.111	0.0	0.0	1.000	-1.000
		-8.552	8.552	0.031	-0.031	0.0	0.0	
2	30853.00	0.0	1.000	-1.000	0.0	0.0	0.0	0.0
		85.210	-85.210	-1.000	1.000	0.0	0.0	
1	87292.94	1.000	0.0	0.0	0.0	0.0	0.0	0.0
		85.210	-85.210	0.0	0.0	0.0	0.0	
12	45106.09	0.0	0.0	0.111	0.0	0.0	0.0	0.0
		-5.016	5.016	0.031	-0.031	1.000	-1.000	

ITERATION #: 4 COST = $ 2162.812

0	-2162.81	0.0	0.0	-0.048	0.976	1.024	0.0	1.000
		4.050	0.0	0.176	0.084	0.0	0.080	
9	534.00	0.0	0.0	0.012	0.006	-0.006	0.0	0.0
		-1.000	1.000	0.006	-0.006	0.0	0.0	
6	1312.72	0.0	0.0	0.011	-0.050	0.050	1.000	-1.000
		0.0	0.0	-0.019	0.019	0.0	0.0	
2	76354.94	0.0	1.000	-0.000	0.500	-0.500	0.0	0.0
		0.0	0.0	-0.500	0.500	0.0	0.0	
1	132794.87	1.000	0.0	1.000	0.500	-0.500	0.0	0.0
		0.0	0.0	0.500	-0.500	0.0	0.0	
12	42427.53	0.0	0.0	0.052	-0.029	0.029	0.0	0.0
		0.0	0.0	0.002	-0.002	1.000	-1.000	

ITERATION #: 5 COST = $ 0.095

0	-0.10	0.0	0.0	0.0	1.000	1.000	0.0	1.000
		-0.000	4.050	0.200	0.060	0.0	0.080	
3	45501.99	0.0	0.0	1.000	0.500	-0.500	0.0	0.0
		-85.210	85.210	0.500	-0.500	0.0	0.0	
6	819.78	0.0	0.0	0.0	-0.056	0.056	1.000	-1.000
		0.923	-0.923	-0.024	0.024	0.0	0.0	
2	76354.94	0.0	1.000	0.0	0.500	-0.500	0.0	0.0
		-0.000	0.000	-0.500	0.500	0.0	0.0	
1	87292.87	1.000	0.0	0.0	0.0	0.0	0.0	0.0
		85.210	-85.210	0.0	0.0	0.0	0.0	
12	40046.26	0.0	0.0	0.0	-0.056	0.056	0.0	0.0
		4.459	-4.459	-0.024	0.024	1.000	-1.000	

ITERATION #: 6 COST = $ 0.056

0	-0.06	0.0	0.0	0.0	1.000	1.000	0.000	1.000
		0.0	4.050	0.200	0.060	0.0	0.080	
3	121174.75	0.0	0.0	1.000	-4.632	4.632	92.308	-92.308
		0.0	0.0	-1.752	1.752	0.0	0.0	
8	888.07	0.0	0.0	0.0	-0.060	0.060	1.083	-1.083
		1.000	-1.000	-0.026	0.026	0.0	0.0	
2	76354.94	0.0	1.000	0.0	0.500	-0.500	0.000	-0.000
		0.0	0.0	-0.500	0.500	0.0	0.0	
1	11620.06	1.000	0.0	0.0	5.132	-5.132	-92.308	92.308
		0.0	0.0	2.252	-2.252	0.0	0.0	
12	36086.05	0.0	0.0	0.0	0.213	-0.213	-4.831	4.831
		0.0	0.0	0.093	-0.093	1.000	-1.000	

```
UNIQUE OPTIMAL SOLUTION:

EPS DILUTION =  0.0 %
RETAINED OWNERSHIP = 98.54%
DEBT-TO-EQUITY RATIO = 1.000
WORKING CAPITAL BALANCE  $ 86086.0


DO YOU WISH SENSITIVITY ANALYSIS TO BE PERFORMED?
yes
```

VARIABLE NAME	BASIS VAR	AMOUNT	UNIT PENALTY	LOW	HIGH	INT.PEN	LOW	HIGH
CONV PRF	3	121174.750	0.0	0.0	0.011	0.0	-0.000	0.011
EXOWN CS	8	888.074	0.0	0.0	0.923	0.0	-0.000	0.923
BONDS	2	76354.937	0.0	0.0	0.400	0.0	-0.120	0.400
COMMON	1	11620.062	0.0	0.0	0.000	0.0	-0.011	0.000
SLAK WC$	12	36086.055	0.0	0.0	0.000	0.0	-0.207	0.000

TARGET	RHS	ACTUAL	LOW	HIGH
PRICE2	2	209149.937	206885.812	223894.187
EPSDIL T	3	0.0	-0.015	0.002
OWN% TGT	4	0.900	0.000	0.985
DER TRGT	5	1.000	0.937	1.010
WC$ TRGT	6	50000.000	***********	86086.000

VARIABLE NAME	NON-BASIC VARIABLE	OPPORTUNITY COST	UNIT PENALTY	LOW
DISCOUNT	4	1.000	1.000	0.000
PREMIUM	5	1.000	1.000	-0.000
SLACK FC	6	0.000	0.0	-0.000
EXCES FC	7	1.000	1.000	0.000
SLOWN CS	9	4.050	4.050	-0.000
EXC DEBT	10	0.200	0.200	0.000
SLK DEBT	11	0.060	0.060	-0.000
EXCS WC$	13	0.080	0.080	0.0

PRINT MERGER DATA ?

yes

```
******************************** MERGER DATA ********************************

        PREMIUM =   0.0 %
        PRICE (000'S)   $  209149.9
        ADJUSTED PRICE (000'S)   $  209149.9


******************************** PACKAGE DATA ********************************

                              VALUE      FRACTION   INT/DIV    SINKING
                              (000'S)               RATE      FUND REQ.
         COMMON STOCK       $ 11620.1      0.056
         CONVERTIBLE PREF. $121174.7       0.579     0.08
         BONDS              $ 76354.9      0.365     0.06          0.0
         CASH               $      0.0     0.000


PRINT POSTMERGER YEAR-END RESULTS ?
yes

*************************** POSTMERGER DATA ********* ********************
                      1973          1974          1975          1976
 EARNINGS 000'S $ 55143.69   $ 62509.59   $ 71193.37   $ 83716.37   $
 EPS            $     5.89   $     6.68   $     7.56   $     8.51   $
 DPS            $     2.36   $     2.67   $     3.02   $     3.40   $
 EPSI           $    94.71   $   108.91   $    86.65   $    31.56   $
 EPSDIL             -0.00%       -3.06%       -6.02%       -8.45%
 OWNERSHIP          98.55%       98.55%       97.91%       93.69%
 SHARES              9356.        9356.        9417.        9841.
 DEBT/EQUITY          1.00         1.00         1.00         1.00

WHAT NOW?
4 ; let's use some of the excess working capital to pay for the acquisition
4
8 / then let's run the same case again
```

```
SPECIFY AMOUNT TO BE PAID WITH CASH (000'S).
36000.

INDICATE TYPE(S) OF SECURITIES TO BE USED IN PACKAGE
BY ENTERING A 0 OR 1 FOR: COMMON STOCK,BONDS,CONVERTIBLE PREFERRED.
list
      1.000        1.000        1.000
/

SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
list
      1.000        1.000
/

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
list
      0.0          1.000        0.0
/

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
1
      0.900        0.0          5.000
/

SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
1
      1.000        0.200        0.060
/

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
1
  50000.000        0.0          0.080
/

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
no
```

```
ITERATION #: 0     COST = $       0.0

ITERATION #: 1     COST = $ 184437.875

ITERATION #: 2     COST = $ 116710.000

ITERATION #: 3     COST = $  55004.031

ITERATION #: 4     COST = $   1307.238

ITERATION #: 5     COST = $      0.064

ITERATION #: 6     COST = $      0.019

UNIQUE OPTIMAL SOLUTION:

EPS DILUTION = -3.45%
RETAINED OWNERSHIP =100.00%
DEBT-TO-EQUITY RATIO = 1.000
WORKING CAPITAL BALANCE  $ 51479.5


PRINT FINAL SIMPLEX TABLEAU ?
no

DO YOU WISH SENSITIVITY ANALYSIS TO BE PERFORMED?
yes
```

VARIABLE NAME	BASIS VAR	AMOUNT	UNIT PENALTY	LOW	HIGH	INT.PEN	LOW	HIGH
CONV PRF	3	114794.812	0.0	0.0	0.120	0.0	-0.000	0.120
SLACK FC	6	1875.717	0.0	******	0.000	0.0	-2.459	0.000
BONDS	2	58355.000	0.0	0.0	0.400	0.0	-0.120	0.400
EXOWN CS	8	1024.444	0.0	0.0	4.050	0.0	-0.000	4.050
SLAK WC$	12	1479.543	0.0	******	0.000	0.0	-2.459	0.000

TARGET	RHS	ACTUAL	LOW	HIGH
PRICE2	2	173149.937	56439.937	199760.375
EPSDIL T	3	0.0	-0.035	1.000
OWN% TGT	4	0.900	0.000	1.000
DER TRGT	5	1.000	0.886	1.431
WC$ TRGT	6	50000.000	***********	51479.543

VARIABLE NAME	NON-BASIC VARIABLE	OPPORTUNITY COST	UNIT PENALTY	LOW
COMMON	1	0.000	0.0	-0.000
DISCOUNT	4	1.000	1.000	0.000
PREMIUM	5	1.000	1.000	0.000
EXCES FC	7	1.000	1.000	0.0
SLOWN CS	9	4.050	4.050	-0.000
EXC DEBT	10	0.200	0.200	-0.000
SLK DEBT	11	0.060	0.060	0.000
EXCS WC$	13	0.080	0.080	0.0

PRINT MERGER DATA ?
yes

```
******************************** MERGER DATA ********************************

        PREMIUM =    0.0 %
        PRICE (000'S)    $  173149.9
        ADJUSTED PRICE (000'S)    $  173149.9


******************************** PACKAGE DATA *******************************

                                  VALUE      FRACTION    INT/DIV     SINKING
                                  (000'S)                 RATE      FUND REQ.
         COMMON STOCK        $       0.0       0.0
         CONVERTIBLE PREF.  $114794.8         0.549       0.08
         BONDS               $  58355.0       0.279       0.06          0.0
         CASH                $  36000.0       0.172


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* *********************
                        1973          1974          1975          1976
 EARNINGS 000'S $  56215.68   $  63581.61   $  72239.87   $  84584.25   $
 EPS            $      6.10   $      6.90   $      7.79   $      8.74   $
 DPS            $      2.44   $      2.76   $      3.11   $      3.50   $
 EPSI           $*********    $*********    $    296.78   $     42.66   $
 EPSDIL              -3.45%        -6.37%        -9.19%       -11.40%
 OWNERSHIP          100.00%       100.00%        99.38%        95.26%
 SHARES              9220.         9220.         9277.         9679.
 DEBT/EQUITY          1.00          1.00          1.00          1.01

WHAT NOW?
2 ; change company 2 data to include synergistic benefits
2
3 6 8 / add premium; increase convertible pref. yield; go back to package det.
```

```
DO YOU WISH TO ENTER YOUR OWN DATA FOR COMPANY 2 ?
yes

SPECIFY THE EARNINGS OF FIRM 2 FOR YEARS  1967, 1968, 1969, 1970, 1971,
1972,
list
   5600.000    6400.000    7400.000    8500.000    9700.000   11200.000
?
   6000.       6900.       8000.       9200.      10400.      12100.

ENTER THE FOLLOWING DATA:
    1. SHARE PRICE
    2. NUMBER OF OUTSTANDING SHARES
    3. DIVIDEND PAYOUT RATIO (%)
list
     58.750    3560.000       0.500
/

    4. TOTAL LONG-TERM DEBT OUTSTANDING
1
  50000.000
/

    5. WORKING CAPITAL
1
   3000.000
/

    6. BOOK VALUE OF EQUITY
1
  50000.000
/


************************* PRE-ACQUISITION DATA **************************
```

YEAR	EARNINGS 1	EARNINGS 2
1967	$30700.	$ 6000.
1968	$33750.	$ 6900.
1969	$37100.	$ 8000.
1970	$40800.	$ 9200.
1971	$44900.	$10400.
1972	$49400.	$12100.

DO YOU WISH TREND ANALYSIS TO BE PERFORMED ?
n

****************************** CURRENT YEAR DATA ******************************

	SHARES (000'S)	STOCK PRICE	EPS	DPS	P/E	GROWTH RATE
COMPANY 1	9220.	$ 85.21	$ 5.36	$ 2.14	15.9	0.10
COMPANY 2	3560.	$ 58.75	$ 3.15	$ 1.57	18.7	0.15

**************************** ESTIMATED FUTURE DATA ****************************

YEAR	EARNINGS 1	EARNINGS 2	DEBT 1	DEBT 2	EQUITY 1	EQUITY 2	EPS 1	EPS 2
1972	$ 49400.	$ 12100.	$ 700000.	$ 50000.	$ 700000.	$ 50000.	$ 5.36	$ 3.15
1973	$ 54340.	$ 13915.	$ 732604.	$ 56957.	$ 732604.	$ 56957.	$ 5.89	$ 3.91
1974	$ 59774.	$ 16002.	$ 735864.	$ 58001.	$ 735864.	$ 58001.	$ 6.48	$ 4.50
1975	$ 65751.	$ 18403.	$ 739451.	$ 59201.	$ 739451.	$ 59201.	$ 7.13	$ 5.17
1976	$ 72326.	$ 21163.	$ 743396.	$ 60581.	$ 743396.	$ 60581.	$ 7.84	$ 5.94

SPECIFY THE PREMIUM TO BE PAID FOR THE ACQUISITION.
20%

```
PRICE2 = $  250980.
EXCHANGE RATIO = 1.209

SPECIFY AMOUNT TO BE PAID WITH CASH (000'S).
list
  36000.000
/

PRICE2 = $  214980.
EXCHANGE RATIO = 1.411

OK ?
y

INDICATE TYPE(S) OF SECURITIES TO BE USED IN PACKAGE
BY ENTERING A 0 OR 1 FOR: COMMON STOCK,BONDS,CONVERTIBLE PREFERRED.
1 1 1

SPECIFY THE B4-TAX-INTEREST-RATE, AND THE
ANNUAL PERCENTAGE SINKING FUND REQUIREMENT.
6% 0%

SPECIFY THE CONVERTIBLE PREFERRED DIVIDEND YIELD,
AND CONVERSION RATIO.
list
      0.0         0.0
10% 1.2%

SPECIFY YOUR ESTIMATE OF WHAT PERCENTAGE OF THE TOTAL CONVERTIBLE PREFERRED
ISSUE WILL BE CONVERTED BY THE ENDS OF YEARS 1973 THRU 1976
list
      0.0         0.050       0.400       1.000
/

IF YOU WISH TO SPECIFY THE RELATIVE PROPORTION OF BONDS
AND/OR CONVERTIBLE PREFERRED ?  TYPE 0
IF YOU PREFER TO HAVE THE PROGRAM DETERMINE THESE PROPORTIONS
BASED ON YOUR GOALS, TYPE 1.
1
```

```
SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
list
      1.000       1.000
/

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
1
      0.0         1.000       0.0
/

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
list
      0.900       0.0         5.000
/

SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
list
      1.000       0.200       0.060
/

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
1
  50000.000       0.0         0.080
52000. /

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
n
```

```
ITERATION #: 0     COST = $       0.0

ITERATION #: 1     COST = $ 226371.312

ITERATION #: 2     COST = $ 158022.437

ITERATION #: 3     COST = $  97351.437

ITERATION #: 4     COST = $   2313.625

ITERATION #: 5     COST = $      0.060

ITERATION #: 6     COST = $      0.051

UNIQUE OPTIMAL SOLUTION:

EPS DILUTION =  0.00%
RETAINED OWNERSHIP = 91.86%
DEBT-TO-EQUITY RATIO = 1.000
WORKING CAPITAL BALANCE  $ 52493.5


PRINT FINAL SIMPLEX TABLEAU ?
no

DO YOU WISH SENSITIVITY ANALYSIS TO BE PERFORMED?
no
```

```
PRINT MERGER DATA ?
yes

********************************* MERGER DATA *********************************

         PREMIUM =  20.0 %
         PRICE (000'S)   $  214979.9
         ADJUSTED PRICE (000'S)   $  214979.9


********************************* PACKAGE DATA ********************************

                               VALUE      FRACTION   INT/DIV    SINKING
                               (000'S)               RATE     FUND REQ.
          COMMON STOCK       $ 69633.2      0.277
          CONVERTIBLE PREF.  $ 66335.2      0.264     0.10
          BONDS              $ 79011.2      0.315     0.06         0.0
          CASH               $ 36000.0      0.143


PRINT POSTMERGER YEAR-END RESULTS ?
yes

***************************** POSTMERGER DATA ********* *********************
                      1973          1974          1975          1976
 EARNINGS 000'S $ 59156.23   $ 66677.37   $ 75386.75   $ 87043.94   $
 EPS            $     5.89   $     6.64   $     7.48   $     8.41   $
 DPS            $     2.36   $     2.66   $     2.99   $     3.36   $
 EPSI           $    17.03   $    19.59   $    21.48   $    18.64   $
 EPSDIL             -0.00%        -2.47%        -4.91%        -7.15%
 OWNERSHIP          91.86%        91.86%        91.50%        89.04%
 SHARES             10037.        10037.        10077.        10355.
 DEBT/EQUITY          1.00          1.00          1.00          1.01

WHAT NOW?
8 / let's change the eps dilution target to something higher.
```

```
SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
list
      1.000        1.000
/

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
list
      0.0          1.000        0.0
-5.0% /

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
list
      0.900        0.0          5.000
/

SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
TSO MODIFICATION AT 1800
list
PLEASE LOGOFF THEN
      1.000        0.200        0.060
/  some of the above messages are system messages, not program messages.

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
list
  52000.000        0.0          0.080
/

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
n
```

```
ITERATION #: 0     COST = $       0.0

ITERATION #: 1     COST = $ 226371.312

ITERATION #: 2     COST = $ 158022.437

ITERATION #: 3     COST = $  97351.437

ITERATION #: 4     COST = $  23787.375

ITERATION #: 5     COST = $   3455.527

ITERATION #: 6     COST = $   2474.491

UNIQUE OPTIMAL SOLUTION:

EPS DILUTION = -0.90%
RETAINED OWNERSHIP = 90.00%
DEBT-TO-EQUITY RATIO = 1.000
WORKING CAPITAL BALANCE  $ 53770.9


PRINT FINAL SIMPLEX TABLEAU ?
yes
```

0	-2474.49	0.0	0.0	0.0	0.934	1.066	1.000	0.0
		2.333	1.717	0.166	0.094	0.0	0.080	
7	2474.38	0.0	0.0	0.0	0.066	-0.066	-1.000	1.000
		-2.333	2.333	0.034	-0.034	0.0	0.0	
3	48675.71	0.0	0.0	1.000	0.500	-0.500	0.0	0.0
		-85.210	85.210	0.500	-0.500	0.0	0.0	
2	79011.19	0.0	1.000	0.0	0.500	-0.500	0.0	0.0
		-0.000	0.000	-0.500	0.500	0.0	0.0	
1	87292.87	1.000	0.0	0.0	0.000	-0.000	0.0	0.0
		85.210	-85.210	0.000	-0.000	0.0	0.0	
12	1770.98	0.0	0.0	0.0	-0.066	0.066	0.0	0.0
		6.164	-6.164	-0.034	0.034	1.000	-1.000	

DO YOU WISH SENSITIVITY ANALYSIS TO BE PERFORMED?
yes

VARIABLE NAME	BASIS VAR	AMOUNT	UNIT PENALTY	LOW	HIGH	INT.PEN	LOW	HIGH
EXCES FC	7	2474.385	0.0	0.0	2.000	1.000	0.264	2.000
CONV PRF	3	48675.715	0.0	0.0	0.027	0.0	-0.020	0.027
BONDS	2	79011.187	0.0	0.0	0.331	0.0	-0.189	0.331
COMMON	1	87292.875	0.0	0.0	0.020	0.0	-0.027	0.020
SLAK WC$	12	1770.980	0.0	0.0	0.080	0.0	-0.378	0.080

TARGET	RHS	ACTUAL	LOW	HIGH
PRICE2	2	214979.875	177260.562	241976.500
EPSDIL T	3	-0.050	-39519.457	-0.004
OWN% TGT	4	0.900	0.852	0.926
DER TRGT	5	1.000	0.903	1.135
WC$ TRGT	6	52000.000	***********	53770.980

VARIABLE NAME	NON-BASIC VARIABLE	OPPORTUNITY COST	UNIT PENALTY	LOW
DISCOUNT	4	0.934	1.000	0.066
PREMIUM	5	1.066	1.000	-0.066
SLACK FC	6	1.000	0.0	-1.000
EXOWN CS	8	2.333	0.0	-2.333
SLOWN CS	9	1.717	4.050	2.333
EXC DEBT	10	0.166	0.200	0.034
SLK DEBT	11	0.094	0.060	-0.034
EXCS WC$	13	0.080	0.080	0.0

PRINT MERGER DATA ?
yes

```
******************************** MERGER DATA ********************************

        PREMIUM =  20.0 %
        PRICE (000'S)    $  214979.9
        ADJUSTED PRICE (000'S)    $  214979.9


******************************** PACKAGE DATA ******************************

                                  VALUE      FRACTION    INT/DIV    SINKING
                                  (000'S)                 RATE     FUND REQ.
          COMMON STOCK         $ 87292.9      0.348
          CONVERTIBLE PREF.    $ 48675.7      0.194       0.10
5 MINUTES TILL SHOW TIME
          BONDS                $ 79011.2      0.315       0.06         0.0
          CASH                 $ 36000.0      0.143


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* *********************
                    1973          1974          1975          1976
 EARNINGS 000'S $ 60922.18   $ 68443.31   $ 77064.44   $ 88103.50   $
 EPS            $     5.95   $     6.68   $     7.50   $     8.41   $
 DPS            $     2.38   $     2.67   $     3.00   $     3.36   $
 EPSI           $    13.59   $    15.63   $    17.47   $    16.83   $
 EPSDIL             -0.91%       -3.06%       -5.19%       -7.19%
 OWNERSHIP          90.00%       90.00%       89.75%       88.00%
 SHARES             10244.       10244.       10273.       10478.
 DEBT/EQUITY          1.00         1.00         1.00         1.01

WHAT NOW?
8 / let's decrease the penalty of excess debt issued.
```

```
SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
/

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
list
     -0.050        1.000        0.0
/

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
1
      0.900        0.0          5.000
90% 0 0

SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
1
      1.000        0.200        0.060
1. 15% / this constraint has been 'softened' relative to the eps goal.

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
1
  52000.000        0.0          0.080
/

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
n
```

```
ITERATION #: 0      COST = $       0.0

ITERATION #: 1      COST = $ 223523.437

ITERATION #: 2      COST = $ 158022.375

ITERATION #: 3      COST = $  97351.375

ITERATION #: 4      COST = $  21996.500

ITERATION #: 5      COST = $   1141.914

UNIQUE OPTIMAL SOLUTION:

EPS DILUTION = -3.21%
RETAINED OWNERSHIP = 85.25%
DEBT-TO-EQUITY RATIO = 1.000
WORKING CAPITAL BALANCE  $ 57291.8


PRINT FINAL SIMPLEX TABLEAU ?
n

DO YOU WISH SENSITIVITY ANALYSIS TO BE PERFORMED?
n

PRINT MERGER DATA ?
y
```

```
********************************** MERGER DATA **********************************

         PREMIUM =  20.0 %
         PRICE (000'S)   $  214979.9
         ADJUSTED PRICE (000'S)   $  214979.9


********************************** PACKAGE DATA ********************************

                              VALUE      FRACTION    INT/DIV    SINKING
                              (000'S)                RATE       FUND REQ.
          COMMON STOCK       $135968.6     0.542
          CONVERTIBLE PREF.  $     0.0     0.0       0.10
          BONDS              $ 79011.2     0.315     0.06          0.0
          CASH               $ 36000.0     0.143


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* ********************
                        1973           1974           1975           1976
 EARNINGS 000'S $ 65789.75   $ 73310.94   $ 81688.62   $ 91024.06   $
 EPS            $     6.08   $     6.78   $     7.55   $     8.42   $
 DPS            $     2.43   $     2.71   $     3.02   $     3.37   $
 EPSI           $     8.72   $    10.03   $    11.54   $    13.27   $
 EPSDIL             -3.22%       -4.56%       -5.92%       -7.29%
 OWNERSHIP          85.25%       85.25%       85.25%       85.25%
 SHARES             10815.       10815.       10815.       10815.
 DEBT/EQUITY         1.00         1.00         1.00         1.01

WHAT NOW?
```

```
8/  let's go back to the package determinator program.
 $   BAD ENTRY
?
8/
8 /(the 8 and the / have to be separated by at least one blank space).

SPECIFY THE PENALTY FOR EACH DOLLAR PAID OVER AND BELOW THE SPECIFIED PRICE.
list
      1.000        1.000
/

SPECIFY THE TARGET IMMEDIATE EPS DILUTION ALLOWABLE (%),AND THE PENALTY/REWARD
ATTACHED TO EACH $1 OF EXCESS AND SLACK FIXED CHARGES.
list
     -0.050        1.000        0.0
-5% 10 10 ; the eps target has been transformed into a 'hard' constraint.

SPECIFY THE TARGET PERCENTAGE OWNERSHIP THAT YOU WISH TO RETAIN AND
THE PENALTY/REWARD ATTACHED TO EACH 1% POINT OVER AND BELOW THAT TARGET.
list
      0.900        0.0          0.0
/

SPECIFY THE TARGET DEBT/EQUITY RATIO FOR THE COMBINED COMPANIES AND
THE PENALTY ATTACHED TO EVERY EXCESS AND DEFICITARY DOLLAR OF DEBT.
list
      1.000        0.150        0.060
/

SPECIFY THE MINIMUM WORKING CAPITAL BALANCE REQUIRED AND THE PENALTIES
ATTACHED TO EACH SURPLUS AND DEFICITARY DOLLAR.
list
  52000.000        0.0          0.080
/

DO YOU WISH THE SIMPLEX TABLEAUX TO BE DISPLAYED?
n
```

```
ITERATION #: 0     COST = $       0.0

ITERATION #: 1     COST = $ 335503.312

ITERATION #: 2     COST = $ 213044.937

ITERATION #: 3     COST = $  74146.687

ITERATION #: 4     COST = $  72464.312

ITERATION #: 5     COST = $  49003.816

ITERATION #: 6     COST = $  31446.359

ITERATION #: 7     COST = $  24743.965

ITERATION #: 8     COST = $  11419.059

ITERATION #: 9     COST = $   8269.687

UNIQUE OPTIMAL SOLUTION:

EPS DILUTION = -5.00%
RETAINED OWNERSHIP = 87.87%
DEBT-TO-EQUITY RATIO = 1.086
WORKING CAPITAL BALANCE  $ 57194.4


PRINT FINAL SIMPLEX TABLEAU ?
TSO COMING DOWN NOW
PLEASE LOGOFF NOW
no  (above two lines are system messages).

PRINT MERGER DATA?
yes
```

```
******************************** MERGER DATA ********************************

        PREMIUM =  20.0 %
        PRICE (000'S)    $  214979.9
        ADJUSTED PRICE (000'S)    $  214979.9


******************************** PACKAGE DATA ********************************

                              VALUE      FRACTION    INT/DIV     SINKING
                              (000'S)                 RATE      FUND REQ.
         COMMON STOCK       $108402.9      0.432
         CONVERTIBLE PREF.  $      0.0     0.0        0.10
         BONDS              $106576.7      0.425      0.06          0.0
         CASH               $ 36000.0      0.143


PRINT POSTMERGER YEAR-END RESULTS ?
yes

**************************** POSTMERGER DATA ********* ********************
                     1973          1974          1975          1976
 EARNINGS 000'S $ 64929.75    $ 72450.87    $ 80828.56    $ 90164.00    $
 EPS            $     6.19    $     6.91    $     7.70    $     8.59    $
 DPS            $     2.48    $     2.76    $     3.08    $     3.44    $
 EPSI           $    10.94    $    12.58    $    14.47    $    16.64    $
 EPSDIL             -5.00%        -6.51%        -8.03%        -9.55%
 OWNERSHIP          87.88%        87.88%        87.88%        87.88%
 SHARES             10492.        10492.        10492.        10492.
 DEBT/EQUITY         1.09          1.09          1.09          1.09

WHAT NOW?
0 / end session. Use of FUSION has been demonstrated.

READY
time
CPU - 00:00:01  EXECUTION - 00:04:20  SESSION - 00:27:47
READY
logoff GAC LOGGED OFF TSO AT 18:48:54 ON DECEMBER 28, 1972+
```

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