

EVALUATION OF THE QUANTITATIVE
GROWTH OF A COMPANY

by 680

EDWARD LOYD TURNER

B. S., Kansas State University, 1966

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

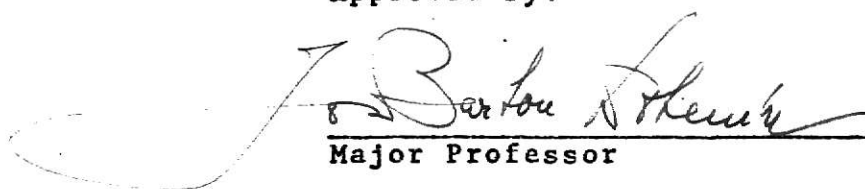
MASTER OF SCIENCE

College of Commerce

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1969

Approved by:


Major Professor

LD
2668
R4
1969
T8

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION.....	1
Statement of the Problem and Purpose of Study	
Definition of Terms and Scope of the Study	
Sources and Procedures of the Study	
Organization of the Study	
II. HISTORY OF COMPANY GROWTH ANALYSIS.....	8
Combined Qualitative and Quantitative Analysis	
Quantitative Analysis	
Conclusions	
III. THE GROWTH INDEX MODEL.....	18
Components of the Growth Index	
Computation of the Growth Index	
Weighted Versus Unweighted Index Numbers	
IV. EVALUATION OF FINDINGS.....	38
Growth Indices	
Comparative Analysis of Various Quantitative	
Growth Theories	
External Variables	
Conclusions	
V. SUMMARY.....	52
APPENDIX.....	55
BIBLIOGRAPHY.....	66

LIST OF TABLES

Table	Page
1. Bowyer's Indices of Growth.....	14
2. Index Numbers of Quantitative Growth Factors.....	24
3. Growth Indices.....	29
4. Gross National Product Converted Into Index Number Form and Multiplied by 700.....	30
5. Cohen and Zinbarg Analysis Vs. Calculated Growth Index.....	43
6. Bowyer's Growth Analysis Vs. Calculated Growth Index.....	45
7. Badger and Coffman Analysis Vs. Calculated Growth Index.....	47
8. Slope of Regression Line of Calculated Growth Index Vs. GNP Index.....	50

LIST OF ILLUSTRATIONS

Figure	Page
1. Growth Indices for the Test Companies.....	31
2. Alpha Portland Cement Co. Growth Index vs. GNP Index.....	32
3. E. I. DuPont De Nemours & Co. Growth Index vs. GNP Index.....	32
4. Beech Aircraft Corp. Growth Index vs. GNP Index.....	33
5. Cessna Aircraft Co. Growth Index vs. GNP Index.....	34
6. International Business Machines Growth Index vs. GNP Index.....	35
7. Kansas Gas and Electric Co. Growth Index vs. GNP Index.....	36
8. Kansas Power and Light Co., Growth Index vs. GNP Index.....	36
9. Piper Aircraft Co. Growth Index vs. GNP Index.....	37

CHAPTER I

INTRODUCTION

Economic growth is a concept that has several meanings. Thus, for example, growth of an industrial organization can be viewed as qualitative or quantitative. Qualitative growth can consist of better management personnel, greater marketing and production knowledge, and other factors that can be measured only in the subjective sense. Quantitative growth may include such accounting items as increases in sales, net income, assets, owners' equity, earnings per share, number of plants, and other items that can be numerically measured. The concept presented in this paper concerns the quantitative aspects of company growth.

The quantitative growth of a business firm is important for several reasons. The most significant concerns its contribution to the economic growth of the nation. Economic growth has been defined by Franklin V. Walker as "an increase in the nation's output, which occurs both because the ability to produce rises and because this added ability is employed."¹ Major attention by economists considering the problems of economic growth has been centered upon the broad aggregates regarded as crucial to such growth. Comparatively little

¹Franklin V. Walker, Growth, Employment and the Price Level, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963). p. 2.

attention has been paid to the details of industrial growth, which are the main components of economic growth.

Quantitative goals can be established as controls by the management of a company. These standards of performance can be integrated into company policies. The degree to which these standards are increased from year to year is dependent upon management's ability to measure the company's historic quantitative growth.

Another reason for the importance in measuring quantitative growth concerns a company's long-term existence. If a company does not maintain a pace comparable to the growth of others in the industry, it will be slowly squeezed out of business, for a business concern can exist without growth only for a short period of time.² A company must be able to perpetuate itself, and this self-perpetuation is partially accomplished by quantitative growth.

Development and improved production, too, depend on quantitative growth. The autonomous organization would invest in research and development as a prerequisite for survival.³ Therefore, new products and production processes must be developed to keep abreast with competition. Investments in research and development create new investment opportunities.⁴

²Keith Powlison, "Obstacles to Business Growth," Harvard Business Review XXXI, (March-April, 1953), p. 48.

³Robert A. Solo, Economic Organizations and Social Systems, (Kansas City: The Bobbs-Merrill Company, Inc., 1967), p. 255.

⁴Sumner H. Slichter, Economic Growth in the United States, (Baton Rouge: Louisiana State University Press, 1961), p. 106.

Companies continue investing in research and development because they have reasons to think that the expenditures will prove profitable. If something useful can be developed from the expenditures in research and development, production and sales will develop normally.⁵ Research and development also have a direct bearing upon economic growth because it governs technological change which is one method of rapidly and continually promoting economic growth.

The opportunities that a company offers its management and other employees depend also on quantitative growth. A company that is growing can offer its employees opportunities to advance, and if the employees know there are chances for advancement, they are challenged to do better work. Thus, company growth has a motivational effect for its employees.

Statement of the Problem and Purpose of the Study

In our profit-orientated business system, the management, owners, and potential investors of a company must be able to measure its quantitative growth effectively. Unfortunately, there is a wide variance of opinion within management circles with respect to (a) defining quantitative growth; and (b) the reliability of methods presently employed to determine quantitative growth.

A survey of literature indicates that there are two basic deficiencies in previous theories of quantitative growth

⁵ Robert L. Blomstrom and Keith Davis, Business and Its Environment, (St. Louis: McGraw-Hill Book Company, 1966), p. 153.

measurement. One weakness often encountered is the very small number of growth characteristics used in measuring the total quantitative growth. This results in problems concerning the reliability of the analysis. It can be dangerous to rely upon only one growth characteristic to measure quantitative growth for if it happens to be misleading, there is nothing to compensate for the mistake.

The second deficiency encountered is that even when several growth characteristics are utilized, they are not combined into one growth factor or index. The resulting problem in this case is that of divergent trends. Several factors or characteristics utilized may indicate increases in growth, whereas, others may indicate decline. These must be assimilated into a single indicator before drawing any conclusions about the overall quantitative growth of a company.

The principal purpose of this study is to develop a meaningful method of measuring the overall quantitative growth of a firm which eliminates these two deficiencies. This is accomplished by combining seven key accounting factors into a single quantitative growth index.

Definition of Terms and Scope of the Study

Webster gives a very general definition of growth: "the process of growing; increasing in size, number, frequency, and strength."⁶ This definition can be very easily applied to a

⁶Webster's New International Dictionary 2nd Edition Revised, Unabridged, (Springfield, Mass.: G.&C. Merriam Company, 1950).

business concern, but several refinements should be made. Growth should not be defined as a simple increase but as an increase over a certain minimum level and, for the purpose of this study, quantitative growth is defined as an increase in the growth index of a company above the growth of the gross national product expressed in constant 1958 dollars. The natural growth rate of a company should equal the growth rate of the national economy. As a result, a growth company's index should increase faster than the minimum natural growth rate determined by the national indices.

The scope of this study is confined to the determination of a growth index that measures the quantitative growth of a company simply and accurately.

Growth indices are calculated for eight companies, each of which had available financial records dating from 1950 to 1966. Three companies were selected in one industry to ensure that a better comparison could be made, company-to-company, and company-to-gross national product. The remaining companies were randomly selected from a list of companies which had available accounting information dating from 1950 to 1966. This period was chosen because it includes a complete economic cycle.

Sources and Procedures of the Study

The information for the literature review was obtained from books and magazines for such areas of study as investment and investment portfolios, administration, management, statistics

and economic growth. The data for the computation of the growth index were obtained from Moody's Industrial Manual and Moody's Public Utility Manual. The Wholesale Price Index for industrial commodities was obtained from Federal Reserve Bulletins and the Gross National Product from The National Income and Product Accounts of the United States, 1929-1965.

The growth index model first converts all the raw data to constant 1957-1959 dollars and then to index number form. Then the growth index is computed by adding the seven index numbers (net sales, net income, total assets, total owners' equity and the ratios of: net income to total assets, net income to total owners' equity and net sales to total assets). Initially, the growth indices are used to determine whether or not the selected company has grown quantitatively as fast as other companies in the same industry. The growth indices are also used to determine the rate of growth of the company in relation to the growth of the national economy.

Organization of the Study

Chapter I has presented an introduction to the problem of measuring quantitative growth. Basic terms were defined, and procedures were discussed. In Chapter II, previous studies of this problem are reviewed, and examples are given of calculation by other authors of quantitative growth.

The method used in this study to obtain a growth index is discussed in Chapter III. Specific elements of the growth index are described and the growth indices for each of the

eight test companies are presented. Company-to-company and company-to-gross national product comparisons are graphed. In Chapter IV the results are discussed along with comparisons of the growth index analysis with different analyses presented in Chapter II. Conclusions reached, and a summary of the analysis are given in Chapter V.

CHAPTER II

HISTORY OF COMPANY GROWTH ANALYSIS

A number of theories concerned with the growth of a company have been formulated in the past. Some have been presented from an investment viewpoint, others from a management viewpoint, and still others from an economic viewpoint. Investment analysts have done a substantial amount of research on security analysis and growth stocks. The management approach to growth measurement is an enlargement of the investment analyst's approach, considering the company as a totality; an analysis that considers the company in relation to its general economic environment can be called an economic approach to growth measurement.

Numerous theories are based solely upon subjective or qualitative factors. This study is concerned with the measurement of objective or quantitative growth, therefore, no review of these qualitative theories is presented. Other theories combine qualitative and quantitative characteristics, and several of the best of these are presented. Likewise, several strictly quantitative theories are reviewed with deficiencies of each presented.

In this chapter, a brief historical review of selected theories and an evaluation of their significance is presented. The following discussion is divided into three parts: combined qualitative and quantitative analyses, quantitative analyses, and conclusions.

Combined Qualitative and Quantitative Analysis

Company growth is partially defined by Webster as a change in size, and this definition of growth is one commonly recommended by various authors.¹

The basic differences among theories based on this approach lie in the authors' use of different accounts pertaining to a company's income statement and balance sheet. Several qualitative characteristics are incorporated with some of the quantitative factors from the company's financial statements.

The problem of determining the growth of a company has been extensively investigated from an investment point of view, primarily because of the application of the term "growth stocks" to the stocks of some companies. Babson and Babson define growth stocks as the stock of companies in industries whose sales increase faster than the national economy as a whole, and the stock of companies whose earnings per share move up more than the average of all companies.² They have established these characteristics of a growth company:

1. The company should be engaged in an industry whose rate of sales growth is faster than that of the national economy in periods of expansion and whose volumes does not decline as much in periods of recession.
2. The company should be able to translate its increase in sales into a reasonably comparable rise in net profits per share.

¹M. S. Adelman, Herbert C. Hicks, and Lester V. Plum.

²Thomas E. Babson and David L. Babson, Investing for Successful Future, (New York: Macmillan Company, 1959), p. 133.

3. The company's management should be research-minded.
4. The company's outlay should be in low ratio to its total production costs.
5. The company should have a record of consistently high profit margins.³

All of the above characteristics except the third can be quantitatively measured. These two can only be measured by a personal evaluation of a "reasonably comparable" rise in net profits per share and of the degree of research-mindedness of the management.

In addition to the problem of determining how to measure these two qualitative characteristics, there is the problem of divergent trends. The authors eliminated this problem by stating that all five characteristics must be attained before a company could be classified as a growth company. However, a company does not necessarily have to be engaged in an industry whose rate of sales growth is faster than that of the national economy to be characterized as a growth company. Although this is usually the case, a company in an industry where sales are stagnant, could excel in the other four characteristics and outperform companies in other industries. Babson and Babson would not classify this company as a growth company because of the one failing characteristic.

Thus, their theory uses some subjective characteristics and rules that are too stringent for qualification as a growth

³Ibid., pp. 145-146.

company. Classification as a growth company on the basis of their theory could be relative to their opinion and could be different from another person's point of view. The growth index presented in this paper eliminates these problems by using measurable items, the values of which are published by the companies, and defines quantitative growth in terms of only one compound growth index.

The problem of measuring subjective indicators of a company's performance is also encountered in the approach of Fredrick Amling. The elements of his model are:

1. Rapid sales increase over an extended period of time
2. New product development and alert research department
3. Large capital expenditures
4. High depreciation charges
5. Low dividend payment compared with earnings
6. Frequent stock dividends
7. Above all, aggressive and able management.⁴

All of the above characteristics except for the second and last can be quantitatively measured. Furthermore, difficulties are encountered in defining such words as rapid, high, low, large, and frequent. These are all relative terms, which unless specifically stated, can vary from individual to individual.

Amling, however, did not indicate if all the characteristics or only a portion had to be satisfied to determine whether or not a company can be considered as a growth one. Babson and Babson eliminated this point of confusion while Amling did not. But Amling also uses some subjective concepts and in this respect parallels Babson and Babson's theory.

⁴ Frederick Amling, Investments (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), pp. 583-584.

Quantitative Analysis

A quantitative analysis of growth deals with facts and not with personal thoughts and feelings. This section presents the theories that attempt to measure the growth of a company quantitatively. Investment analysts have done quite a number of studies concerning quantitative growth and particularly the growth effect upon earnings per share.

One of the most recent and extensive studies on growth was conducted by Jerome Cohen and Edward Zinbarg.⁵ Although their approach is initially similar to those in the previous section, their final analysis was based upon strictly objective factors. They consider sales, sales pattern, profits, development of new products, and management as focal points of a growth analysis. They define a growth company as "one whose sales and earnings per share are increasing at a rate faster than the growth of the nation's gross national product and usually faster also than the average of the industry of which the company is a part."⁶ Thus, they ignore the qualitative factors in their growth analysis and concentrate upon the analysis of quantitative factors because the quantitative approach is easier to comprehend and convey to others. Each rate of increase is independently compared with the rate of growth of gross national product. Depending upon how each rate of increase compares with the rate of increase in gross

⁵Jerome B. Cohen and Edward D. Zinbarg, Investment Analysis and Portfolio Management (Homewood, Ill.: Richard D. Irwin, Inc., 1967), pp. 249-355.

⁶Ibid., p. 566.

national product, a company can be classified as experiencing exceptional growth, above-average growth, moderate growth, or no growth. Thus, from the numerous focal points considered, the growth evaluation is reduced to the calculation of the rates of increase in sales and earnings per share.⁷

The basic problem encountered in this approach was that both sales and earnings per share are separately compared with gross national product which could indicate divergent trends. Cohen and Zinbarg failed to comment upon how to classify a company which can be classified as having exceptional growth in sales and no growth in earnings per share. This problem can be eliminated by either combining sales and earnings per share into one compound number or by using only one of these as a measure of quantitative growth as does Value Line Investment Survey.

Five-year and seven-year growth rates for companies are published in reports entitled Value Line Investment Survey.⁸ The method of calculating these rates is based only upon cash earnings per share. To compute the five-year growth rate for 1966, the average cash earnings per share for the three years 1965-1967 are compared with the average cash earnings per share for the three years 1960-1962. The problem encountered in this approach is that of reliability of using only cash earnings per share as a measure of quantitative growth. A

⁷ Ibid., pp. 264-283.

⁸ Value Line Investment Survey (New York: Arnold Bernard and Co., Inc., 1967), p. 200.

reduction in the number of shares outstanding and constant or even slightly declining cash earnings would result in rising cash earnings per share, but in this case, the ratio would be a misleading indicator of growth. In this respect Cohen and Zinbarg's approach would appear to be better because they used several characteristics.

John Bowyer in his study, Investment Analysis and Management,⁹ increases the number of characteristics for measuring quantitative growth to three, i.e., sales, net income after taxes, and earnings per share. He develops a statistical method that is different from that of the authors previously mentioned as he uses index numbers rather than dollar values. He is careful to choose an unbiased base year to eliminate possible distortions. Bowyer argues that the use of index numbers increases data comprehension.¹⁰ In his model, percentage increases in sales, net income after taxes, and earnings per share are each computed separately. Table I is an example of Bowyer's analysis:

TABLE I

Bowyer's Indices of Growth
(Base Year is 1960 = 100)

<u>Growth Factor</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Sales	100	104	106	117	127
Net income	100	149	156	164	217
Earnings per share	100	159	168	178	239

⁹ John W. Bowyer, Jr., Investment Analysis and Management (Third Edition Rev.; Homewood, Ill.: Richard D. Irwin, Inc., 1966), pp. 246-259.

¹⁰ Ibid., pp. 247-248.

The results of this company's growth could easily be evaluated as: a 27 percent increase in sales, a 117 percent increase in net income, and a 139 percent increase in earnings per share.

Some of the problems encountered in Cohen and Zinbarg's analysis appear also in Bowyer's analysis. He does not reflect upon the problem of possible divergent trends. He does not alleviate the problem of using only one or two characteristics of growth; additionally, he does not combine the characteristics into one composite measure of quantitative growth. However, his analysis is improved over Cohen and Zinbarg's by his implementation of index numbers.

The eminent features of Bowyer's analysis are the use of a greater number of characteristics of growth and the utilization of index numbers. His analysis would have had more merit if he had taken the weighted average of the three items listed in Table I and used this as the measure of quantitative growth. This would have given a single measure of growth such as developed by Value Line but would have utilized a greater number of characteristics.

A methodology of evaluating the growth of a company by using a number of characteristics which are combined in a single factor has been proposed by Manown Kisor, Jr.¹¹ The growth factor is computed by using the formula:

$$\text{Rate of growth} = (1 - \text{payout ratio}) \times \text{return on equity}^{12}$$

¹¹Manown Kisor, Jr., "The Financial Aspects of Growth," Financial Analysts Journal XX, No. 2 (March-April, 1964), pp. 46-51.

¹²Ibid., p. 47.

The payout ratio is the percent of net earnings paid out in dividends. The return on equity is viewed as net earnings of the company for an accounting period divided by the average owner's equity for the same period. Although one of the basic deficiencies, that of possible divergent trends, is eliminated, there remains the problem of using too few characteristics. This solution involves using only three accounting characteristics: dividends, net earnings, and owners' equity. Kisor did not stop his analysis with just calculating the growth factor. His theory includes an analysis of the company's economic environment, industry outlook, and the company's position in the industry. The theory thus is divided into four parts, any one of which could show a divergent trend. Even though his analysis combined the basic accounting data into one growth factor, the final analysis of determining the quantitative growth of a company depended upon four independent parts.

Ralph E. Badger and Paul B. Coffman¹³ utilize the same formula as Kisor in calculating a compound growth factor. Badger and Coffman characterize a growth company as one that has a high return on equity and a low dividend payout ratio. They state that as long as a company's compound growth factor is greater than zero it is a growth company.¹⁴ Even though the national economy's growth might be three to five percent, the company is a growth company if its growth is zero to three

¹³Ralph E. Badger and Paul B. Coffman, The Complete Guide to Investment Analysis (San Francisco: McGraw-Hill Book Company, 1967), pp. 109-112.

¹⁴*Ibid.*, p. 112.

percent. This is contrary to the idea presented by such authors as Amling, Babson and Babson, and Cohen and Zinbarg that a company must be growing faster than the nation's economy to be considered a growth company.

Badger and Coffman and Kisor have the correct concept of calculating a simple compound growth rate from several accounting items. However, they fail to eliminate the effect of inflation upon dollar values and utilize too few accounting items.

Conclusion

Analyses that contain any qualitative or subjective factors as growth characteristics must be invalidated as accurate attempts to measure the quantitative growth of a company. The subjective factors cannot be measured and thus give an inaccurate conclusion to any analysis which contains them.

A survey of literature containing many quantitative analyses indicates several deficiencies. The deficiency most commonly encountered is that only a limited number of characteristics is being utilized by the various authors. However, even in theories that did use a larger number, these are not combined in such a way as to eliminate the problem of possible divergent trends.

An imperfection found in all the theories encountered, with the exception of John Bowyer's, was that the analysis is in terms of current dollars instead of constant dollars which distorts any conclusions.

CHAPTER III

THE GROWTH INDEX MODEL

Chapter II presented several concepts for corporate growth evaluation and the elements utilized by different authors. Some of the growth factors are repeated in various concepts. The growth index developed in this chapter is a combination of the growth factors and ratios that are used recurrently in concepts of corporate growth. This index combines all the factors into one composite index number, rather than analyzing the various components separately as has been done in some of the previous studies.

Components of the Growth Index

It is proposed to use for the growth index a combination of seven index numbers derived from the following accounting concepts:

1. Net sales
2. Net income
3. Total assets
4. Total owners' equity
5. The ratio of net income to total assets
6. The ratio of net income to total owners' equity
7. The ratio of net sales to total assets

The net sales of a company are the gross sales less returns and allowances and cash discounts. Net sales help determine the relative competitive position of the company within an industry. A company must have sales before it can have any earnings, and the annual growth in sales as compared to some standard is more important than dollar value. The quantitative growth in sales

is an important part of any company and thus must be considered a vital part of the evaluation of the company's total quantitative growth.

The annual net income after taxes is just as important as sales. The common stockholder is concerned about net income because dividends come from net income. Since net income is vital to the life of a company, the growth of net income must be considered in the evaluation of the quantitative growth of a company.

Total assets are the sum of current assets, investments, intangible assets, and plant (fixed) assets. Current assets include such items as cash, marketable securities, and accounts receivable, notes receivable, inventories and prepaid expenses. Investments are items held for an indefinite period of time. Intangible assets are assets which lack physical substance such as patents and goodwill. Net value of plant or fixed assets include land, buildings, machinery and equipment. The total assets of a company represent the book value of the company, and the growth in total assets is thus another essential factor in determining the quantitative growth of a company.

Total owners' equity is the balance sheet value of stock plus retained earnings and paid-in surplus. The owners' equity of a company represents the owners' claim to the residual assets of the company (total assets minus liabilities). Growth in owners' equity can result from an increase in common stock, in retained earnings, and/or in paid-in surplus. Owners'

equity represented by retained earnings is an important way of internally financing the assets of a company. New issues of stock, as common or preferred, increase the owners' equity and represents an external method of financing the assets of a firm. Convertible bonds are external financing which could ultimately increase owners' equity. Thus, the growth in owners' equity must be assessed when evaluating the company's quantitative growth.

The operating efficiency of a company can be studied by relating real input to real output. A company must strive for maximum efficiency in order to be competitive in its industry, and since the operating efficiency is so important it must be used in determining the quantitative growth of the company. This study uses the following measures of operating efficiency: (1) net income to total assets, and (2) net sales to total assets.

The earning power of a company can be measured by the ratio of net income to total assets. This is an indication of the ability of the company to earn profits. The ratio of net sales to total assets, represents an approximation of the turnover of assets. This is a representation of exactly how hard total assets are being used in generating the sales of the company. Both of these ratios are important to any company and thus are included in the growth index.

The last component used in computing the growth index is the comparison of net income to total owners' equity. This is a financial ratio measuring the effectiveness of the company's

management in employing entrusted capital.

Computation of the Growth Index

Appendix A lists the firms from which the test companies were randomly selected. It was essential that financial statements from 1950 to 1966, including all the data necessary for the desired computations, be available. The raw data for the eight test companies are presented in Appendix B. For later application, these were converted into constant 1957-1959 dollars, using the wholesale price indices that are shown in Appendix C.

The constant dollar data were then converted into index number form by dividing the 1950 constant dollar value into each of the yearly constant dollar values from 1951 to 1966. This conversion was made for each of the seven growth components. The yearly index numbers for each of the seven growth components for the test companies are presented in Table 2.

The yearly growth indices for each test company were calculated by summing the yearly index numbers of the seven growth components. These are presented in Table 3 and plotted on Graph 1. The base year of 1950 had an index of 700 for all the companies analyzed. The GNP was also converted into index number form and multiplied by 700 to put it on the same basis as the company growth indices; this conversion is shown in Table 4.

To compare each company's quantitative growth with that of the national economy, a simple linear equation was used. Using

the national economy's growth factor as the independent variable and the company's calculated growth index as the dependent variable, the slope of the line was determined. The slope of the regression line determined whether the company's growth was as fast or faster than the national economy's growth factor. If the slope of the regression line was positive and greater than one, the resulting growth index was increasing at a rate faster than the growth rate of the national economy. If the slope of the regression line was positive but less than one, the calculated growth index was increasing but at a rate less than that of the national economy. Thus, the company was not keeping pace with the national economy and not maintaining its natural growth. Graphs 2-9 indicate the points determined by plotting the company's growth indices against GNP, and the slopes of the simple regression lines formulated by the points.

Weighted Versus Unweighted Index Numbers

Throughout the literature review, none of the authors attempted to "weight" any one of their components over another. Weights are applied to items in such a way as to account for their relative significance in the overall situation that is being described. It is very difficult, if not impossible, to determine which is more significant, sales or net income, assets or owners' equity, as in the long run it is unlikely to have one and not the other. Therefore, the application of weights to indicate the relative significance of the various components of the growth index would have been purely arbitrary and a matter of personal judgment.

Not all the factors or components utilized by the various authors in the literature reviewed were used in the growth index. Only those quantitative components which were employed repeatedly and assumed to be most significant were used. No attempt was made to determine their relative significance and all were assigned equal weights.¹ This was done by first converting the components to index numbers, thus eliminating the possibility of weighting by relative magnitude. The composite growth index was then calculated by summing the seven index numbers, thus providing equal weighting for each.

¹Inadvertently there is some weighting due to the fact that some accounting items were used more than once.

TABLE 2

INDEX NUMBERS OF QUANTITATIVE GROWTH FACTORS^a

Alpha Portland Cement Company

<u>Year</u>	<u>Quantitative Growth Factors</u>						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1950	100	100	100	100	100	100	100
1951	76	76	110	103	72	94	94
1952	77	78	107	105	76	98	98
1953	75	75	105	105	75	100	100
1954	112	112	105	114	122	108	109
1955	109	106	108	123	123	113	116
1956	132	131	108	129	159	120	121
1957	71	95	66	107	116	162	122
1958	63	86	65	112	108	172	126
1959	94	113	80	130	152	161	135
1960	65	79	90	142	103	158	131
1961	51	59	86	134	79	157	133
1962	47	57	87	141	77	162	134
1963	23	34	65	129	47	199	136
1964	24	37	67	132	48	197	128
1965	7	12	60	123	15	206	126
1966	5	8	56	116	10	206	121

Legend:

Quantitative Growth Factors

- 1 = Net income to total assets
- 2 = Net income to owners' equity
- 3 = Net sales to total assets
- 4 = Net sales
- 5 = Net income
- 6 = Total assets
- 7 = Total owners' equity

^aData from Appendix B

TABLE 2 - (Continued)

Beech Aircraft Corporation

Year	Quantitative Growth Factors						
	1	2	3	4	5	6	7
1950	100	100	100	100	100	100	100
1951	50	121	80	182	114	226	94
1952	88	243	169	494	257	292	106
1953	141	473	305	754	348	247	74
1954	236	498	195	413	501	212	101
1955	290	411	223	396	515	177	125
1956	213	321	170	357	446	209	139
1957	163	281	180	470	425	261	152
1958	165	212	171	423	409	248	193
1959	178	225	144	386	479	269	213
1960	186	240	136	423	581	312	242
1961	101	122	101	308	307	305	252
1962	110	134	90	290	353	321	264
1963	72	90	95	316	238	332	266
1964	114	145	128	455	405	355	279
1965	165	211	132	514	646	391	306
1966	203	286	137	670	998	491	349

Cessna Aircraft Co.

1950	100	100	100	100	100	100	100
1951	143	316	151	338	320	223	101
1952	167	402	187	513	457	274	114
1953	163	293	200	537	438	269	150
1954	329	576	216	549	835	254	145
1955	382	622	213	591	1058	277	170
1956	379	726	189	729	1460	386	201
1957	318	568	182	728	1273	400	224
1958	374	581	215	873	1518	406	261
1959	494	648	209	1049	2482	503	383
1960	437	512	197	1017	2258	517	441
1961	294	346	156	836	1622	552	468
1962	261	299	159	884	1446	554	484
1963	271	321	162	947	1590	586	495
1964	350	429	181	1200	2320	662	541
1965	399	540	171	1432	3353	840	621
1966	371	577	171	1892	4094	1103	710

TABLE 2 - (Continued)

E. I. DuPont De Nemours & Co.

Year	Quantitative Growth Factors						
	1	2	3	4	5	6	7
1950	100	100	100	100	100	100	100
1951	60	63	109	108	66	99	103
1952	62	56	105	110	65	105	117
1953	61	54	107	119	68	111	125
1954	85	71	99	114	98	115	138
1955	96	80	101	125	119	124	149
1956	78	63	91	115	98	127	156
1957	75	60	89	114	96	127	159
1958	62	44	79	103	80	131	184
1959	72	51	86	116	97	135	189
1960	62	44	83	117	87	141	199
1961	64	45	80	120	96	150	211
1962	76	55	96	131	103	137	188
1963	83	62	107	139	108	130	175
1964	95	78	131	149	107	113	147
1965	75	59	131	159	91	121	154
1966	67	54	129	163	85	127	158

International Business Machines

1950	100	100	100	100	100	100	100
1951	64	75	94	113	76	120	102
1952	63	73	109	139	80	128	109
1953	59	76	110	168	90	153	120
1954	74	94	114	187	122	164	129
1955	80	97	125	222	142	178	146
1956	81	102	133	269	163	202	159
1957	74	71	128	346	199	269	282
1958	90	86	130	395	275	305	318
1959	94	85	131	433	311	329	365
1960	99	85	131	471	356	361	417
1961	106	86	134	555	438	415	508
1962	92	86	113	631	511	558	592
1963	132	90	145	674	613	465	681
1964	117	94	137	1053	904	771	959
1965	115	91	133	1148	989	862	1084
1966	102	78	127	1324	1059	1041	1355

TABLE 2 - (Continued)

Kansas Gas and Electric Co.

Year	Quantitative Growth Factors						
	1	2	3	4	5	6	7
1950	100	100	100	100	100	100	100
1951	93	94	112	105	88	94	94
1952	85	90	96	119	104	123	116
1953	83	90	92	136	122	147	135
1954	95	103	101	152	143	150	139
1955	83	89	94	160	141	170	159
1956	90	96	93	167	162	179	169
1957	90	96	96	168	158	175	165
1958	93	98	97	171	164	177	167
1959	96	102	99	179	173	180	171
1960	94	93	93	184	186	197	199
1961	90	92	94	196	189	210	206
1962	92	94	100	217	200	217	213
1963	99	105	105	232	220	221	210
1964	100	105	103	235	226	227	215
1965	99	104	101	236	230	232	221
1966	94	106	98	246	236	251	223

Kansas Power and Light Co.

1950	100	100	100	100	100	100	100
1951	82	82	101	101	82	100	100
1952	85	91	101	107	90	106	99
1953	82	78	105	114	89	109	114
1954	88	90	103	121	103	117	115
1955	93	96	112	131	109	117	113
1956	106	103	117	137	125	117	121
1957	102	102	118	137	119	117	117
1958	102	102	119	138	119	116	116
1959	120	107	126	148	141	118	132
1960	114	103	125	153	139	123	136
1961	110	104	119	158	147	133	141
1962	111	104	122	168	153	137	147
1963	111	103	126	177	156	141	152
1964	117	108	126	184	171	146	158
1965	117	108	124	188	177	151	163
1966	119	110	126	193	182	153	166

TABLE 2 - (Continued)

Piper Aircraft Corp.

<u>Year</u>	<u>Quantitative Growth Factors</u>						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1950	100	100	100	100	100	100	100
1951	204	263	101	136	274	135	104
1952	118	161	135	226	198	168	123
1953	84	124	149	282	159	189	129
1954	104	132	139	254	189	183	144
1955	257	386	140	364	664	259	172
1956	332	451	148	504	1128	340	250
1957	319	364	142	506	1134	356	312
1958	238	251	134	502	889	374	354
1959	244	264	137	622	1107	453	420
1960	204	187	106	724	1391	682	743
1961	56	46	94	566	338	604	730
1962	105	92	90	600	699	664	758
1963	141	126	93	685	1032	733	816
1964	192	189	106	971	1754	913	928
1965	238	224	121	1219	2399	1006	1072
1966	197	214	106	1393	2580	1313	1207

TABLE 3

GROWTH INDICES
(1950 = 700)

Year	Alpha Portland Cement Co.	Beech Aircraft Corp.	Cessna Aircraft Co.	E. I. DuPont De Nemours & Co.	IBM	Kansas Gas & Electric Co.	Kansas Power & Light Co.	Piper Aircraft Co.
1950	700	700	700	700	700	700	700	700
1951	625	869	1593	614	645	681	647	1217
1952	639	1649	2114	619	701	732	680	1129
1953	636	2342	2050	645	776	805	691	1116
1954	782	2156	2904	718	885	884	736	1145
1955	799	2138	3313	794	989	896	771	2242
1956	900	1855	4069	728	1109	955	826	3153
1957	738	1931	3692	721	1370	948	812	3133
1958	732	1820	4228	682	1599	967	813	2743
1959	866	1893	5768	746	1748	1000	892	3247
1960	768	2120	5378	733	1919	1047	892	4038
1961	699	1495	4301	766	2243	1077	912	2434
1962	706	1362	4088	786	2583	1132	942	3009
1963	633	1408	4372	804	2801	1192	966	3626
1964	633	1882	5683	815	4034	1212	1011	5054
1965	549	2364	7355	792	4422	1223	1028	6279
1966	524	3134	8919	782	5087	1255	1049	7009

TABLE 4

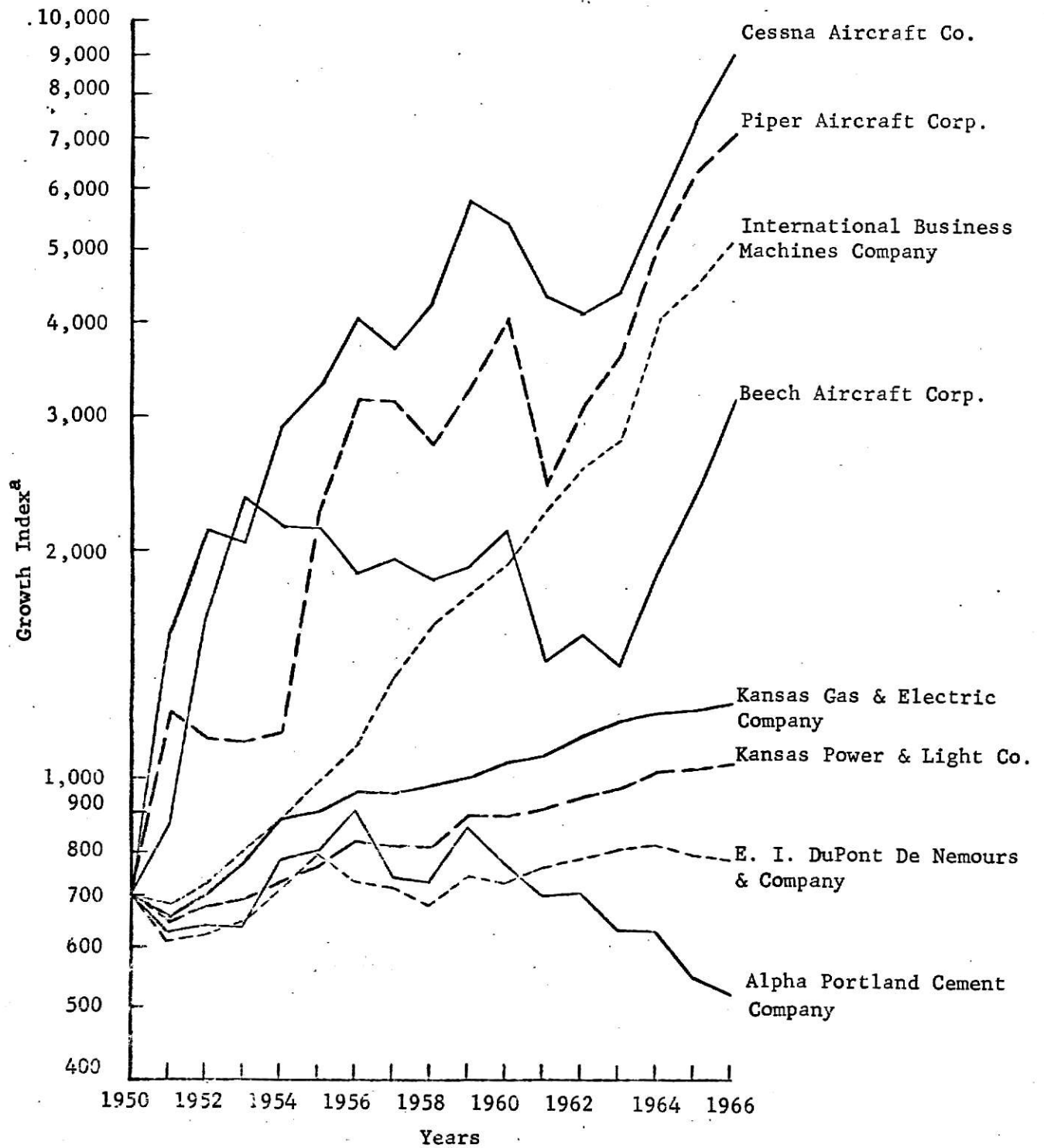
GROSS NATIONAL PRODUCT^a
CONVERTED INTO INDEX NUMBER FORM
AND MULTIPLIED BY 700

(1950 = 700)

<u>Year</u>	<u>GNP</u>
1950	700
1951	755
1952	778
1953	814
1954	803
1955	863
1956	880
1957	894
1958	882
1959	940
1960	963
1961	981
1962	1046
1963	1088
1964	1144
1965	1218
1966	1288

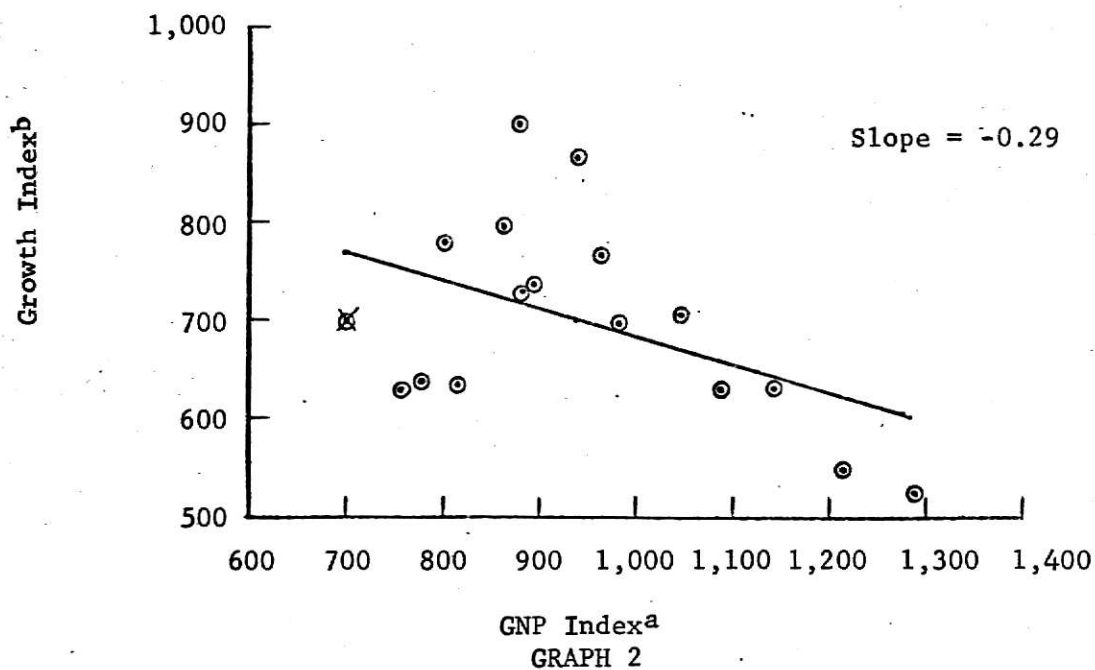
^aData from Appendix D.

GRAPH 1

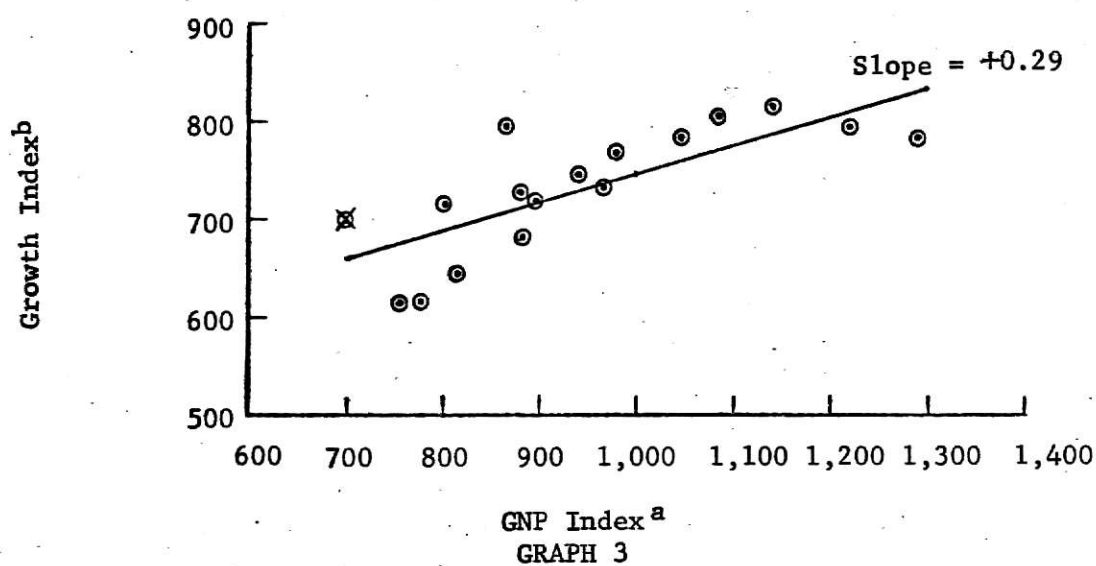


Growth Indices for the Test Companies
(semi-logarithmic, 2 cycle)

^aFrom Table 3



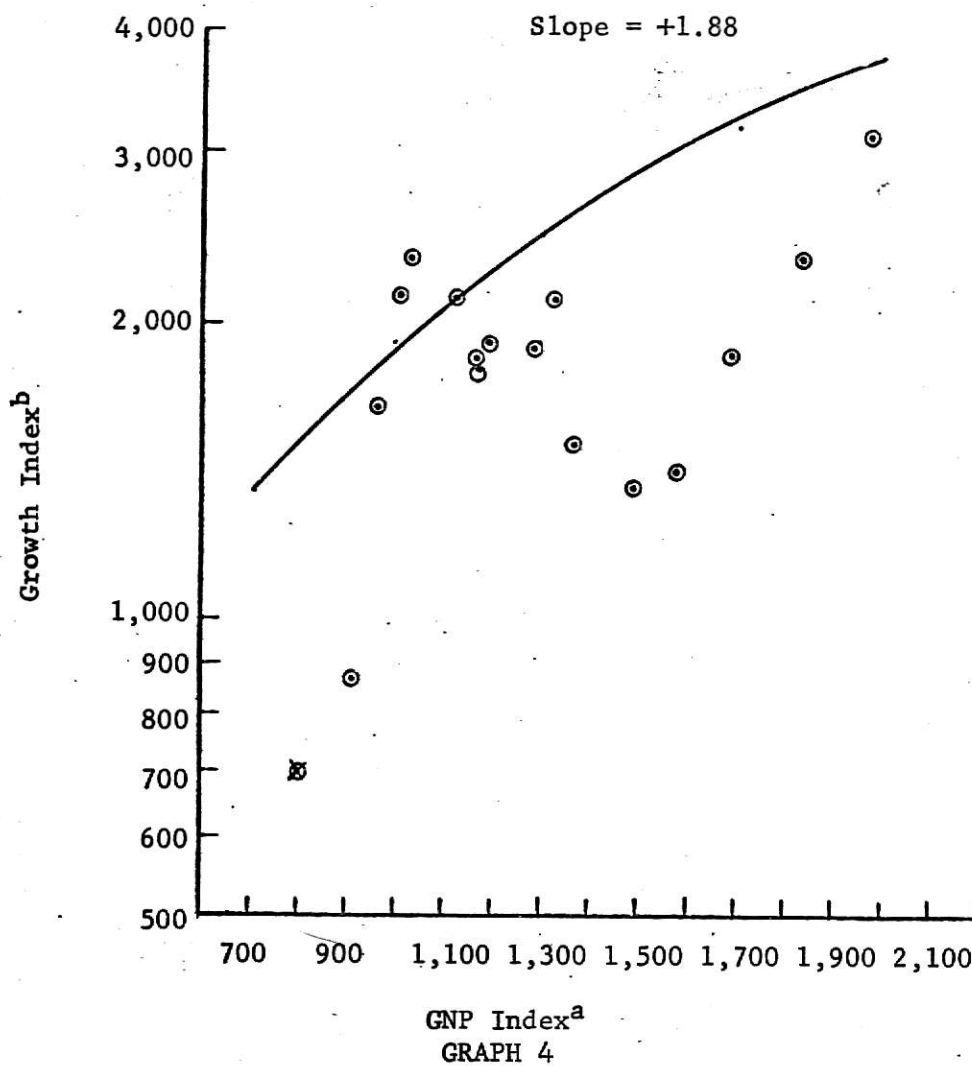
Alpha Portland Cement Co. Growth Index vs. GNP Index



E. I. DuPont De Nemours & Co. Growth Index vs. GNP Index

^aFrom Table 4

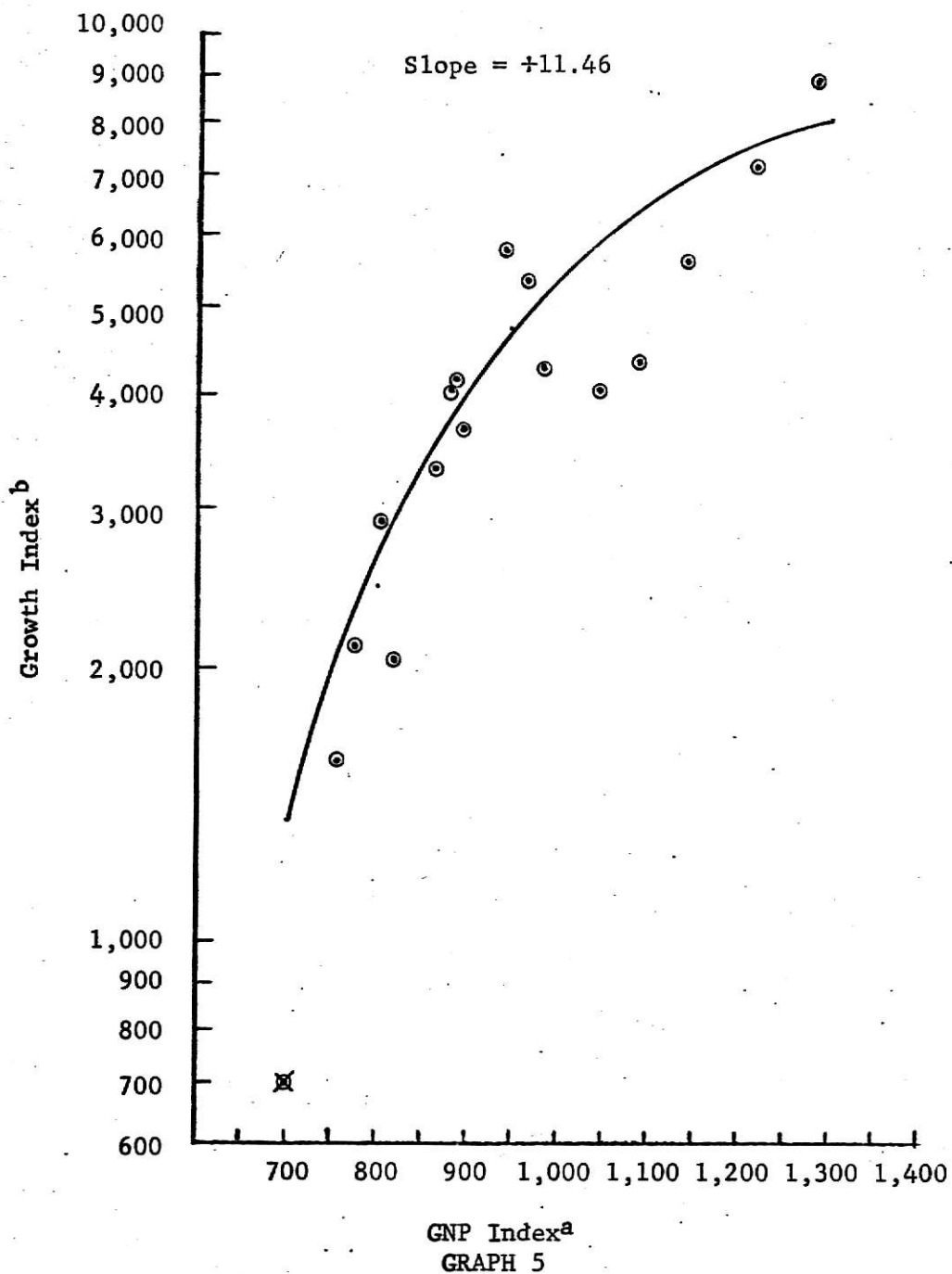
^bFrom Table 3



Beech Aircraft Corp.
Growth Index vs. GNP Index
(Semi-logarithmic, 2 cycles)

^aFrom Table 4

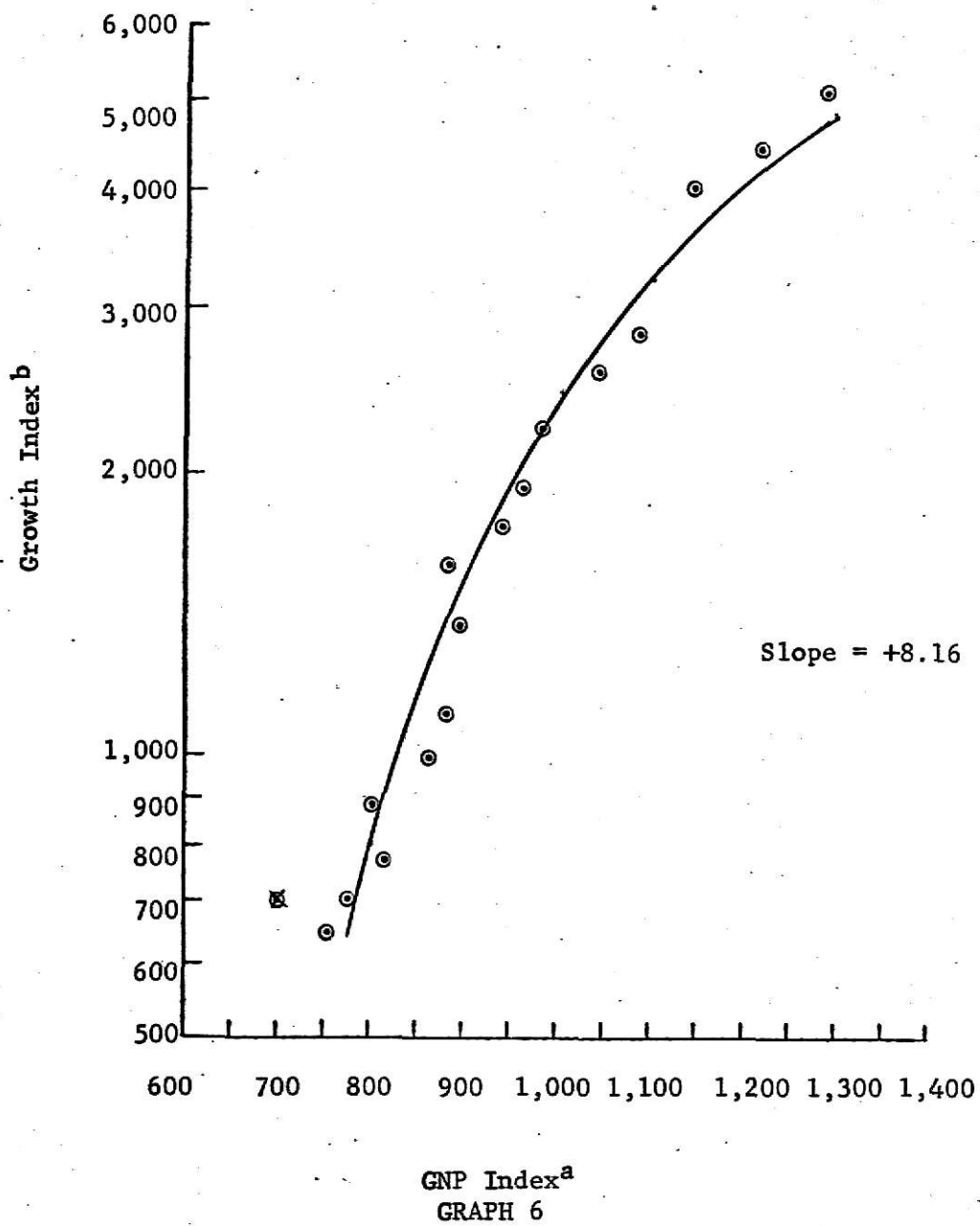
^bFrom Table 3



Cessna Aircraft Co. Growth Index vs. GNP Index (semi-logarithmic, 2 cycles)

^aFrom Table 4

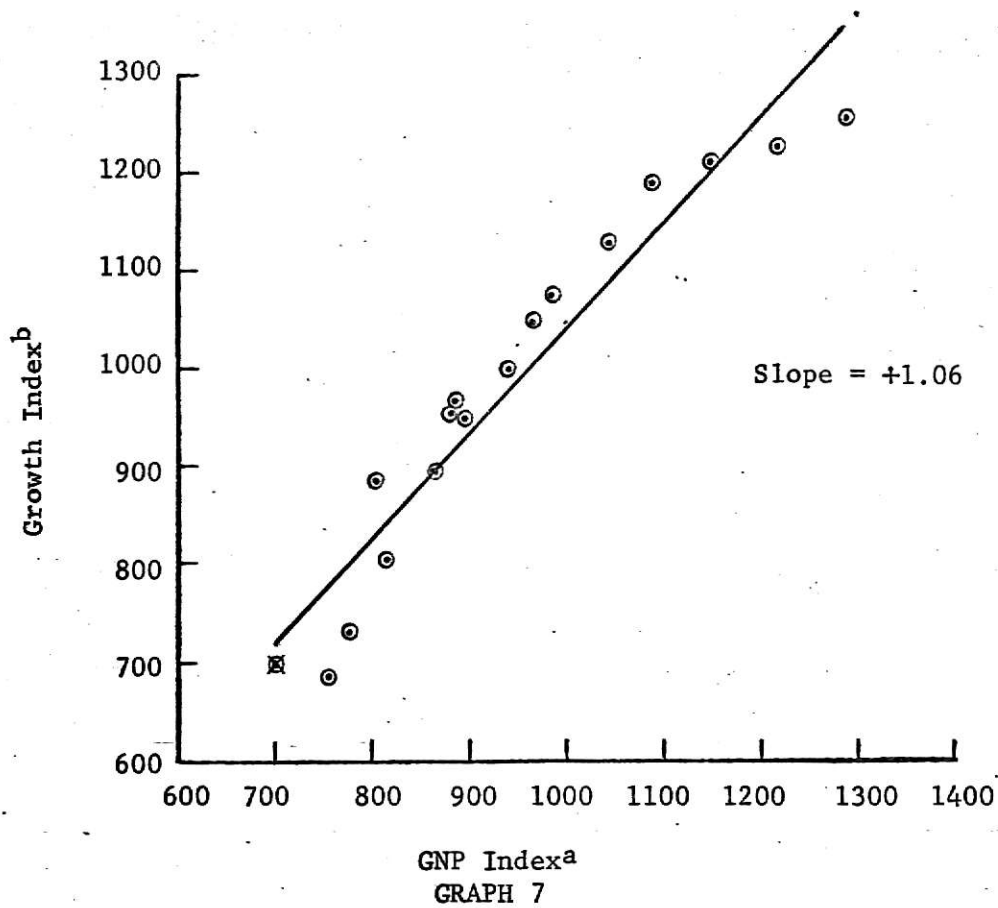
^bFrom Table 3



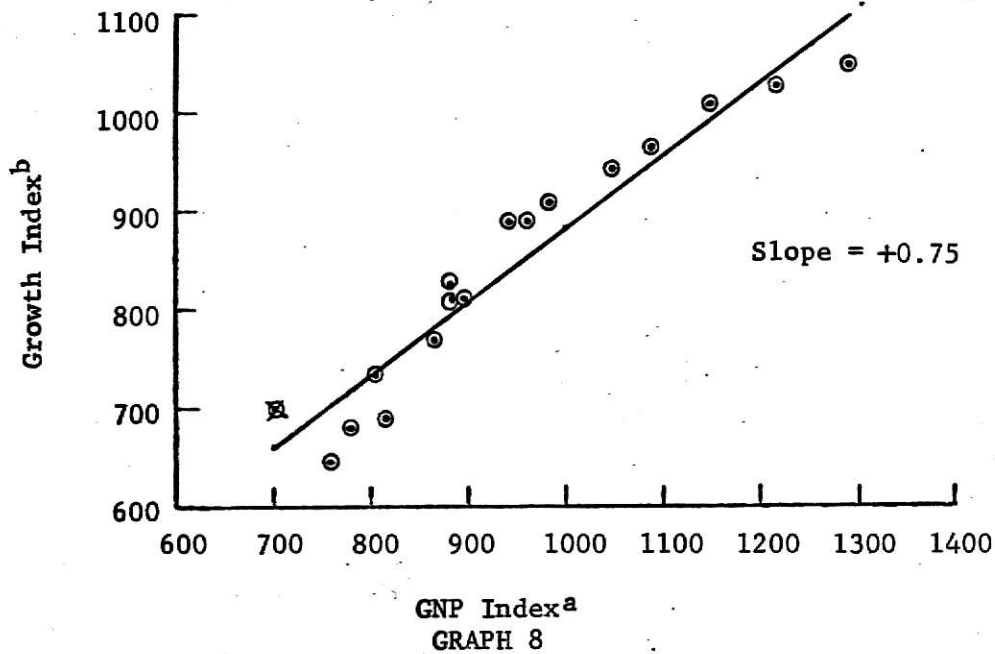
International Business Machines vs. GNP Index (semi-logarithmic, 2 cycles)

^aFrom Table 4

^bFrom Table 3



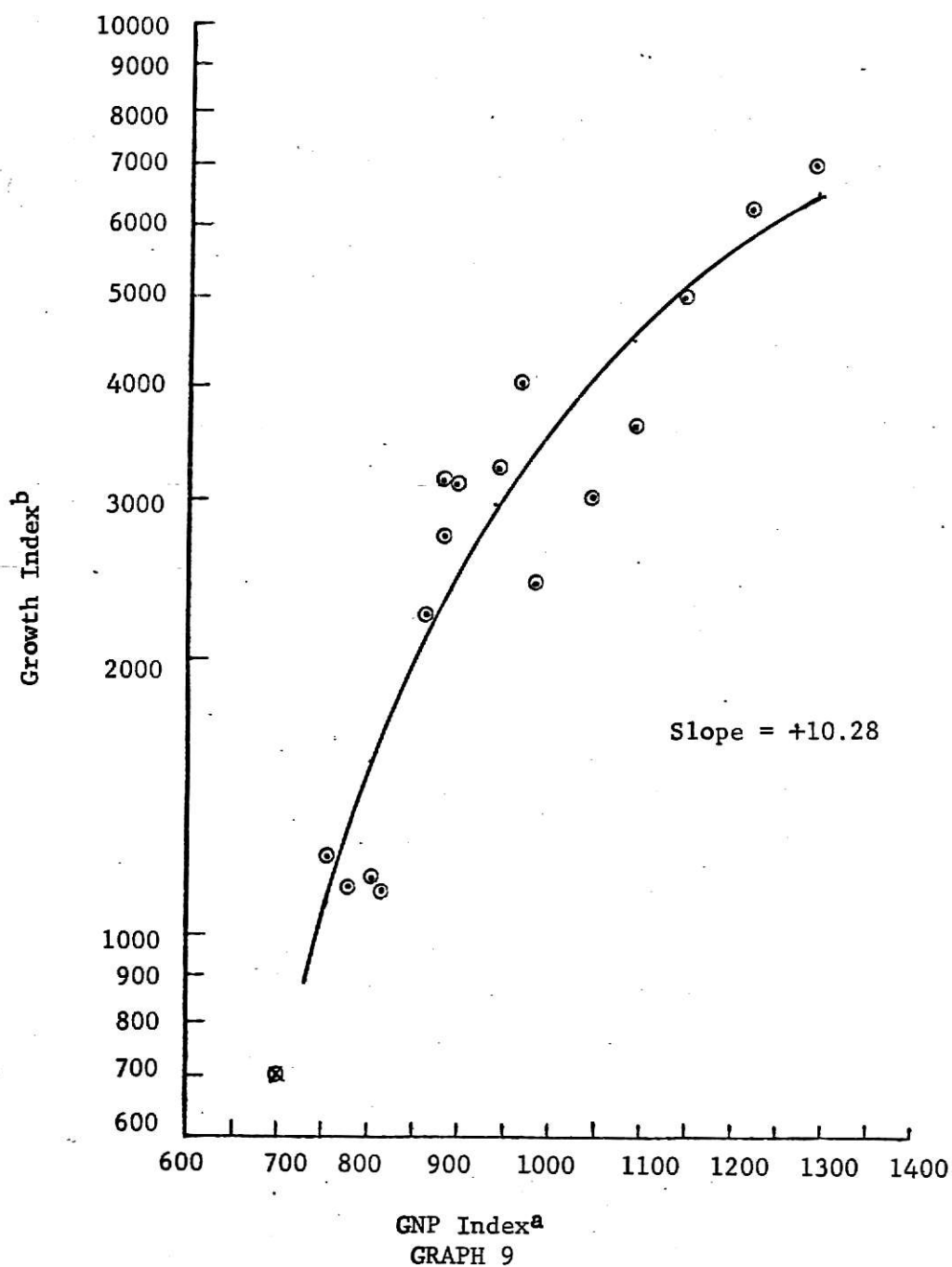
Kansas Gas and Electric Co. Growth Index vs. GNP Index



Kansas Power and Light Co. Growth Index vs. GNP Index

^aFrom Table 4

^bFrom Table 3



Piper Aircraft Co. Growth Index vs. GNP Index (semi-logarithmic, 2 cycle)

^aFrom Table 4

^bFrom Table 3

CHAPTER IV

EVALUATION OF FINDINGS

Growth Indices

The findings presented in Chapter III indicate that on the basis of the model developed the quantitative performance of a company can be evaluated. Graph 1 showed the relationship of the individual indices and illustrates that in a comparison only companies in the same industry can be meaningfully compared. Thus, for example, IBM is commonly recognized as a growth company, but its growth indices are below those of Cessna Aircraft Company and Piper Aircraft Corporation. IBM, however, has shown a steady climb, and the two aircraft companies have had large drops and rises which indicate erratic growth. The two utility companies, Kansas Gas and Electric and Kansas Power and Light, have shown steady and stable increases in their indices. However, the increases have not been as great as those of IBM. This pattern would be expected because the utility companies are closely regulated by the government and IBM is not. Additionally, the type of product produced and sold differs greatly between the two. It is unlikely that utility companies can create new products whereas IBM creates new products and thus increases the demand for its products.

The selection of the base year can also affect the results. The year 1950 was selected as the base year in this study because the period 1950 to 1966 contains an economic cycle. The

dollar values of the raw data for the aircraft companies were very low in 1950, whereas IBM's data were already at a high level. For example, Cessna Aircraft Company had a sales of \$7,158,499 and net income of \$227,052 in 1950 whereas IBM had sales of \$214,916,717 and net income of \$33,301,309 in 1950. Thus, a \$5,000,000 increase in sales for both would amount to a 70 percent increase for Cessna Aircraft Co., and a 2 percent increase for IBM. The relative magnitude of the dollar values allowed the aircraft companies to grow quantitatively at a faster rate than IBM. This original differential in dollar values is the major reason for two of the aircraft companies' growth indices being above IBM's. If 1958 had been selected as the base year, IBM's growth indices would have been above those of each of the test companies, and Cessna and Piper Aircraft growth indices would have fallen between IBM's and Kansas Gas and Electric Company's. This difference in dollar values due to the selection of the base year does not impede the analysis as long as comparisons are made within an industry.

In this paper a company is considered a growth company if (1) its computed growth index is increasing, and if (2) its growth is increasing faster than the growth of the national economy. When a company's calculated growth indices are compared with the GNP indices, as in Graphs 2 - 9, the real growth of the company can be evaluated. Thus, for example, the growth indices of Alpha Portland Cement Company indicate a regression line having a negative slope, (-0.29) in Graph 2. This

indicates that this company has been declining while the United States economy has been increasing.

E. I. DuPont De Nemours and Company's computed growth indices in Graph 1 indicate a stable company with slight increases and declines over the 17-year period. The slope of the regression line, (+0.29) in Graph 3 also indicates that this company's growth during the past 17 years has fallen behind that of the national economy. It has not even accomplished its natural growth, requiring at least a slope of +1.

Beech Aircraft Corporation's indices appear to be lowest of the three aircraft companies, but it has grown faster than the national economy, as is indicated by its regression line slope of +1.88. As a result, it can be classified as a growth company because its quantitative growth was greater than the natural growth of the United States economy.

Cessna Aircraft Company demonstrates the greatest quantitative growth of the three aircraft companies, and when compared with the growth of the national economy, its regression line slope appears to be +11.46. See Graph 5.

Piper Aircraft Corporation's growth indices had a slope of +10.28 when compared with the GNP indices in Graph 9. This slope was lower than Cessna Aircraft Company's but higher than Beech Aircraft Corporation's.

The growth index model presented in Chapter III indicates that of the three companies in the light aircraft industry Cessna Aircraft Company appears to have achieved the greatest quantitative growth. Its growth index in 1966 was 8919 while

Piper Aircraft Corporation's was 7009 and Beech Aircraft Corporation's was 3134. When the companies' growth indices are compared with those of the national economy for the 17-year period, again Cessna Aircraft Company's quantitative growth has been better than the other two. All three companies can be classified as growth companies.

IBM accomplished a regression line slope of +8.16 when compared with the GNP indices for the 17-year period, as is shown in Graph 6. The yearly growth indices of IBM have been stable and constantly increasing over the entire period which none of the other test companies were able to accomplish. IBM's growth indices fulfilled the requirements for classification as a growth company.

The two utility companies increased at about the same rate as the GNP index. Kansas Gas and Electric Company shows a slope of +1.06 in Graph 7, and Kansas Power and Light Company's regression line slope in Graph 8 is +.75. The growth of these two companies has been steady, a result to be expected of a government regulated public utility.

Comparative Analysis of Various Quantitative Growth Theories

In order to be a superior measure of the quantitative growth of a company, the growth index calculated in this paper must be compared with other measures of quantitative growth as presented in Chapter II. The deficiencies of the numerous growth theories were presented at the end of Chapter II. The following comparisons are made to indicate how the growth

index eliminates the deficiencies of the other theories, thus proving that it is a superior measure of the quantitative growth of a company.

The first comparison is with the Cohen and Zinbarg analysis as presented on page 12 of this paper. Table 5 presents the rates of increase or decrease in sales and earnings per share for Kansas Gas and Electric Company. According to their analysis, these two accounting items are compared with the rate of increase in Gross National Product, GNP. In 14 of the 17 years used, the rate of increase in Kansas Gas and Electric Company's sales was above the rate of increase in GNP. In only 9 of the 17 years the rate of increase in their earnings per share was above the rate of increase in GNP. An immediate problem occurs in attempting to classify this company as one having exceptional growth as indicated by sales or as one having moderate growth as indicated by earnings per share.

In this case examples of divergent trends were evident in five of the years analyzed in Table 5. In 1951, 1952, 1955, 1960, and 1962, sales increased faster than GNP while earnings per share did not increase as fast as GNP. In each of these years Cohen and Zinbarg's analysis could not be used because of the divergent trends. When the rate of increase in the growth index computed in this paper is compared with the rate of increase in the GNP, the divergent trends are eliminated. The comparison indicates that in only 8 of the 17 years was the growth index increasing faster than GNP. This is also

COHEN AND ZINBARG ANALYSIS VS. CALCULATED GROWTH INDEX

<u>Year</u>	Cohen and Zinbarg Analysis Kansas Gas and Electric <u>Percent of Increase (Decrease)</u>		<u>Percent of Increase (Decrease) In GNP^c</u>	<u>Percent of Increase or (Decrease) In The Calculated Growth Index^d</u>
	<u>Sales^a</u>	<u>Earnings Per Share^b</u>		
1951	15.4	(9.6)	7.9	(2.7)
1952	15.1	0	3.0	7.5
1953	15.7	21.1	4.6	10.0
1954	13.4	16.3	(1.4)	9.8
1955	8.8	(51.5)	7.5	1.4
1956	11.6	15.5	2.0	6.6
1957	6.7	4.5	1.6	(0.7)
1958	4.6	7.7	(1.3)	2.0
1959	6.8	9.5	6.6	3.4
1960	3.8	0	2.4	4.7
1961	6.4	2.2	1.9	2.9
1962	10.5	6.4	6.6	5.1
1963	7.4	14.0	4.0	5.3
1964	1.8	4.7	5.1	1.7
1965	1.5	2.8	6.5	0.9
1966	7.7	6.5	5.7	2.6

^aCalculated from data in Appendix B^bCalculated from data in Appendix B^cCalculated from data in Appendix D^dCalculated from data in Table 3

indicated in Graph 8 in Chapter III where the slope of regression line is only +0.75. A slope of +1.0 would indicate that the company was growing equally as fast as gross national product. When the growth index is calculated to determine the quantitative growth of a company, a conclusive analysis can be made. This may or may not be the case in Cohen and Zinbarg's analysis.

The next comparison is between the computed growth index and Bowyer's analysis as presented in Chapter II. This comparison is presented in Table 6. The index numbers used in Bowyer's analysis are calculated in the same way as the index numbers in the growth index analysis. Bowyer utilizes the net income of a company in addition to sales and earnings per share as used in Cohen and Zinbarg's analysis. However, Bowyer's analysis does not eliminate the problem of divergent trends because he analyzes the three index numbers separately. But, the addition of net income does allow for a weighting of trends. Two of the accounting items could indicate an upward trend and one a downward trend and by weighting the three items equally, the company would be a growth company.

Bowyer's analysis is based upon the rate of increase in the index numbers of the three accounting items. The rates of increase are calculated in Table 6 along with the percent of increase or decrease in the growth index. The percent of increase is the percentage from one year to the next. As shown in Table 6, the percent of increase or decrease in net

BOWYER'S GROWTH ANALYSIS VS. CALCULATED GROWTH INDEX

Bowyer's Analysis E. I. Dupont De Nemours and Co.							Percent Increase or (Decrease) In The Calculated Growth Index ^d
Index Numbers			Percent Increase (Decrease)				
Year	Sales ^a	Net Income ^b	Earnings	Sales	Net Income	Earnings	
			Per Share ^c			Per Share	
1950	100	100	100				
1951	108	66	64	8.0	(34.0)	(35.7)	(12.3)
1952	110	65	64	1.9	(1.5)	(0.8)	0.8
1953	119	68	66	8.2	4.6	3.8	4.2
1954	114	98	97	(4.2)	44.1	46.4	11.3
1955	125	119	119	9.6	21.4	22.6	10.6
1956	115	98	98	(8.0)	(17.6)	(17.5)	(8.3)
1957	114	96	96	(0.9)	(2.0)	(2.0)	(1.0)
1958	103	80	80	(9.6)	(16.7)	(16.7)	(5.4)
1959	116	97	96	12.6	21.3	20.5	9.4
1960	117	87	87	0.9	(10.3)	(9.9)	(1.7)
1961	120	96	95	2.6	10.3	9.6	4.5
1962	131	103	103	9.2	7.3	8.1	2.6
1963	139	108	107	6.1	4.9	4.5	2.3
1964	149	107	106	7.2	0.9)	(0.9)	1.4
1965	159	91	90	6.7	(15.0)	(14.9)	(2.8)
1966	163	85	84	2.5	(6.6)	(7.5)	(1.3)

^aFrom Table 2^bFrom Table 2^cCalculated from data in Appendix B^dCalculated from data in Table 3

income and earnings per share closely parallel each other. These would tend to dictate whether the company is growing or not.

The growth index calculated in this paper combines seven accounting items into one measure of the quantitative growth of a company. Since only one numerical value is used to evaluate the growth, the problem of divergent trends is eliminated. The percent of increase or decrease in the growth index is not of major importance. Bowyer did not compare the rates of increase or decrease in sales, net income, and earnings per share with those of GNP. His analysis is, therefore, incomplete because he has no base from which to measure quantitative growth. The importance of comparing the items in an analysis with GNP has been indicated by numerous authors.¹ Again, the growth index analysis is superior to Bowyer's analysis just as it was to Cohen and Zinbarg's analysis because it does eliminate the problem of divergent trends, and it compares the company's quantitative growth with that of the national economy.

Badger and Coffman's analysis is based upon the formula given on Page 15. This formula is based upon the payout ratio and the return on equity. The formula has been solved for each of the 17 years for Beech Aircraft Corporation and Kansas Power and Light Company and are listed in Table 7. This table also includes the calculated growth indices for both companies.

¹Amling, Babson and Babson, and Cohen and Zinbarg.

TABLE 7

BADGER AND COFFMAN ANALYSIS VS. CALCULATED GROWTH INDEX

<u>Year</u>	Badger and Coffman Analysis Compound Growth Factor ^a		The Calculated Growth Index ^b	
	<u>Beech Aircraft</u>	<u>Kansas Power & Light</u>	<u>Beech Aircraft</u>	<u>Kansas Power & Light</u>
1950	1.26	4.62	700	700
1951	2.87	2.84	869	647
1952	13.00	3.53	1649	680
1953	22.20	2.86	2342	691
1954	27.87	4.97	2156	736
1955	22.22	4.33	2138	771
1956	15.93	5.30	1855	826
1957	13.62	4.76	1931	812
1958	9.06	4.61	1820	813
1959	10.15	5.41	1893	892
1960	11.60	4.93	2120	892
1961	3.18	5.00	1495	912
1962	3.97	5.02	1362	942
1963	.95	4.88	1408	966
1964	5.01	5.46	1882	1011
1965	9.76	5.37	2364	1028
1966	14.81	5.48	3134	1049

^aCalculated from formula on page^bFrom Table 3

Badger and Coffman's analysis does eliminate the problem of divergent trends as encountered in the two previous analyses. The major deficiencies in this analysis are that not enough accounting items or growth characteristics are utilized and that corrections are not made for inflation. Corrections for inflation are made by using constant dollars and index numbers, both of which are used in the growth index analysis developed in this paper. The formula used by Badger and Coffman uses three accounting items as compared to the seven used in calculating the growth index.

Another deficiency in Badger and Coffman's analysis is that no comparison is made between the rate of growth calculated in the formula and the growth in the gross national product. This is the same problem as encountered in the previous analysis by Bowyer. The growth index analysis does make a comparison with GNP as done in Graphs 2 - 9 in Chapter III. The calculated growth index thus eliminates the deficiencies inherent in Badger and Coffman's analysis.

These comparisons and tables have conclusively indicated that the growth index developed in this paper is superior to previous theories of measuring quantitative growth.

External Variables

The economic condition of the national economy has a substantial effect upon any business concern. The period of time used in this study incorporated a period of general economic prosperity. If there had been more fluctuations or a deep

recession, the selection of a base year for the index number would have been more critical to the analysis than it was in this case. The growth index does take into account fluctuations in the national economy and in general business conditions.

The Vietnam conflict has influenced the economic condition of the United States. A conflict such as this would normally have a tremendous effect upon the growth of the aircraft industry. There has been an increase in the dollar sales of military contracts for Beech, Piper, and Cessna, but the percentage of military sales to total sales has not changed very much for any of the three companies. Piper Aircraft Corporation has less than 1 percent of its sales from military contracts. Beech Aircraft Corporation and Cessna Aircraft Company have fluctuated around 40 percent and 20 percent, respectively, for military contracts. It was concluded that the military sales have not been the primary cause for the quantitative growth of these three companies.

The public utilities are not directly related to increased spending during an armed conflict. The inflation which follows most armed conflicts does influence the growth of public utilities because of the increased demand for expansion of its facilities. The effects of inflation are minimized when the growth index presented in this paper is utilized to measure quantitative growth. The effects of inflation are minimized in the growth index due to the use of constant dollars rather

than real dollars and the use of index numbers which eliminate inflation from the base year to any other year.

Conclusions

The growth index presented in the paper does provide an effective and accurate method of comparing the overall quantitative growth of a company with other companies in the same industry. Cessna Aircraft Company was determined to have had greatest quantitative growth of the three aircraft companies presented. Kansas Gas and Electric Company had the greatest growth of the two public utilities presented. The determination of which company had the greatest quantitative growth was not completed until the company's calculated growth indices were compared with the growth indices of the national economy. This determines if the companies had true quantitative growth as defined in this paper by determining the slope of the regression line for the data; growth index versus GNP indices. A summary of the slopes of the regression lines for all eight test companies is as follows:

Table 8
Slope of Regression Line of Calculated Growth Index
Vs. GNP Index

<u>Company</u>	<u>Slope</u>
Alpha Portland Cement Co.	-0.29
Beech Aircraft Corp.	+1.88
Cessna Aircraft Co.	+11.46
E. I. DuPont De Nemour's & Co.	+0.29
International Business Machines	+8.16
Kansas Gas and Electric Co.	+1.06
Kansas Power and Light Co.	+0.75
Piper Aircraft Co.	+10.28

The test companies which accomplished the requirements for being classified as a growth company were:

Beech Aircraft Corp.
Cessna Aircraft Co.
International Business Machines Corp.
Kansas Gas and Electric Co.
Piper Aircraft Corp.

The growth index developed in this paper proved superior to the quantitative growth analyses of Cohen and Zinbarg, Bowyer, and Badger and Coffman. It eliminated the deficiencies in all of these analyses.

CHAPTER V

SUMMARY

This study was undertaken because of the common and trite usage of the term "growth company". This has been a term used in many annual reports and printed materials, all without a common definition of the term and in many cases having varying meanings. Chapter I presented the reasons for measuring quantitative growth and the problems encountered in measuring the quantitative growth of a firm.

In the following parts an attempt was made to develop a composite growth index for measuring more accurately the overall quantitative growth of a company. In the growth index formulated in this paper no new accounting terms are used. It is based on the same accounting concepts as used by other authors, but it combines these in a manner that permits a definite and valid measurement of the quantitative growth of a company. Some of the more significant methods of measuring quantitative growth are presented in Chapter II. Each was found to have some deficiencies, either of creating the problem of divergent trends, of utilizing too few accounting terms, of using subjective characteristics, or of using actual dollar value data. The deficiencies of each author's study were indicated, discussed, and comparisons between studies were made.

The growth index was presented in Chapter III, along with the methodology used to calculate it. The growth index was

composed of seven index numbers. Index numbers were used to provide a basis from which to measure the quantitative growth of a company. The original data presented in Appendix B was converged to constant 1958 dollars by using the factors in Appendix C. This was done before calculating the index numbers and to eliminate the effects of inflation upon the analysis. The growth indices were then compared to the index numbers for Gross National Product (in constant dollars) to determine how the company's quantitative growth compared to that of the national economy. This was done in Graphs 2 - 9 in Chapter III. On the basis of the author's growth model a company can be said to have quantitative growth only if it has grown faster than the national economy.

The comparisons of the growth indices versus Gross National Product do indicate what is expected of the companies in certain industries such as the utilities. The results of the comparisons serve as an additional reason for using the growth index to measure the quantitative growth of a company.

The comparisons of the various methods of analyzing the quantitative growth of a company were presented in Chapter IV. The discussions in this Chapter point out that the growth index analysis did eliminate the deficiencies of the other methods of analysis. Conclusively, the growth index utilized a larger number of accounting terms, related them to the national economy, and combined them in such a way that the quantitative growth of a company could be determined. Therefore,

the growth index analysis appears to be superior to other analyses for determining quantitative growth.

APPENDIX A

LIST FROM WHICH THE TEST COMPANIES WERE SELECTED

Aeronca Aircraft Corp.
Alpha Portland Cement Co.
Beech Aircraft Corp.
Burroughs Corp.
California Portland Cement Co.
Celanese Corp. of America
Cessna Aircraft Co.
Dow Chemical Co.
E. I. DuPont De Nemours and Co.
General Electric Co.
Giant Portland Cement Co.
Grumman Aircraft Engineering Corp.
Honeywell, Corp.
International Business Machines Corp.
Kansas City Power and Light Co.
Kansas Gas and Electric Co.
Kansas-Nebraska Natural Gas Co., Inc.
Kansas Power and Light Co., Inc.
Lone Star Cement Corp.
Monsanto Chemical Co.
National Cash Register Co.
Pfizer (Chas.) and Co., Inc.
Piper Aircraft Corp.
Radio Corporation of America
Ryan Aeronautical Co.
Sperry Rand Corp.
Union Carbide Corp.
United Aircraft Corp.
Western Power and Gas Co., Inc.

APPENDIX B

ALPHA PORTLAND CEMENT COMPANY^a

Year	Net Sales	Net Income	Total Assets	Total Owners' Common Stock		Number Of Common Stock Outstanding
				Equity	Dividends	
1950	21,560,043	3,282,320	26,336,810	24,389,044	1,526,965	586,956
1951	24,324,601	2,576,448	27,114,955	25,204,624	1,760,868	586,956
1952	25,341,796	2,779,962	28,812,069	26,623,718	1,760,868	586,956
1953	25,686,507	2,799,104	29,859,257	27,661,954	1,760,868	586,956
1954	28,170,356	4,576,644	32,685,340	30,477,730	1,760,868	586,956
1955	31,224,259	4,788,076	35,174,341	33,564,710	2,201,096	1,760,868
1956	35,420,777	6,607,198	40,199,012	37,530,582	2,641,326	1,760,868
1957	30,958,384	5,103,339	57,410,354	39,992,592	2,641,329	1,760,868
1958	33,218,026	4,906,208	62,318,046	42,257,470	2,641,229	1,760,868
1959	39,410,310	7,048,247	59,888,758	46,290,266	3,073,673	1,781,442
1960	43,483,052	4,809,196	59,032,017	45,223,299	2,666,163	1,806,871
1961	41,064,180	3,692,303	58,517,249	46,205,231	2,719,371	1,806,870
1962	43,122,731	3,581,200	60,710,865	46,552,811	2,258,620	1,806,870
1963	39,568,210	2,173,844	74,677,270	47,145,629	1,581,026	1,806,870
1964	40,708,134	2,240,819	74,390,687	44,555,173	903,481	1,806,870
1965	38,471,979	706,294	78,647,430	44,357,986	903,480	1,806,870
1966	37,405,170	501,067	81,084,978	44,068,586	790,567	1,806,870

^aFrank J. St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued

BEECH AIRCRAFT CORPORATION^a

Year	Net Sales	Net Income	Total Assets	Total Owners' Equity		Common Stock Dividends	Number Of Common Stock Outstanding
				Equity			
1950	16,454,342	588,848	12,238,021	8,661,625	479,892		2,650,204
1951	32,797,829	735,484	30,355,834	8,919,157	479,892		2,650,204
1952	90,912,046	1,692,754	40,039,544	10,251,992	359,919		2,650,204
1953	140,457,780	2,321,052	34,256,414	7,211,102	719,838		2,650,204
1954	78,033,435	3,386,089	29,777,812	9,997,326	599,865		2,650,204
1955	76,966,496	3,586,510	25,669,209	12,834,654	734,672		2,701,253
1956	74,538,948	3,331,327	32,533,067	15,266,834	899,147		2,701,253
1957	103,904,870	3,369,340	42,965,610	17,648,501	965,803		2,698,339
1958	95,889,733	3,324,663	41,804,019	23,069,084	1,235,331		2,700,813
1959	89,536,620	3,968,280	46,316,240	25,997,154	1,330,056		2,746,412
1960	98,873,800	4,854,059	54,209,531	29,758,826	1,403,030		2,799,642
1961	72,019,890	2,562,102	52,908,342	30,949,450	1,577,643		2,829,699
1962	67,661,887	2,952,614	55,813,590	32,404,545	1,667,046		2,859,175
1963	73,863,580	1,994,498	57,795,414	32,753,227	1,683,102		2,862,670
1964	107,198,966	3,417,483	62,139,835	34,592,457	1,683,102		2,872,061
1965	122,482,994	5,506,180	69,270,305	38,376,659	1,760,358		2,874,661
1966	164,629,825	8,770,026	89,643,588	45,176,016	2,077,823		2,882,250

^aFrank J. St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued

CESSNA AIRCRAFT COMPANY^a

<u>Year</u>	<u>Net Sales</u>	<u>Net Income</u>	<u>Total Assets</u>	<u>Total Owners' Equity</u>	<u>Common Stock Dividends</u>	<u>Number Of Common Stock Outstanding</u>
1950	7,158,499	227,052	7,542,388	6,117,734	175,000	2,425,500
1951	26,482,320	795,144	18,460,102	6,772,878	140,000	2,425,500
1952	41,072,202	1,161,972	23,086,473	7,793,025	280,000	2,533,293
1953	43,560,931	1,126,587	22,985,117	10,371,281	548,331	2,533,293
1954	45,114,489	2,175,473	21,983,901	10,181,200	365,554	2,533,293
1955	50,001,409	2,839,093	24,684,478	12,289,174	731,109	2,533,293
1956	66,266,927	4,205,830	36,900,148	15,617,673	877,331	2,533,293
1957	70,049,431	3,886,018	40,573,276	18,434,567	1,049,142	2,533,293
1958	86,159,520	4,755,062	42,284,613	22,048,594	1,189,881	2,537,914
1959	105,786,342	7,937,455	53,383,410	32,981,880	1,863,528	3,214,506
1960	103,278,498	7,277,220	55,340,301	38,285,492	2,376,623	3,253,013
1961	87,654,316	5,226,748	59,089,525	40,661,107	3,295,039	3,308,982
1962	89,805,586	4,661,444	59,329,612	42,032,657	3,309,673	3,309,937
1963	96,439,914	5,132,926	62,892,904	43,025,112	3,310,761	3,314,078
1964	122,942,252	7,542,186	71,502,712	47,344,651	3,315,843	3,318,646
1965	148,418,624	11,025,487	91,716,023	55,018,025	3,827,186	3,339,528
1966	202,136,131	13,873,128	124,199,435	64,784,289	4,524,902	3,357,953

^aFrank J. St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued

E.I. DuPONT De NEMOURS AND COMPANY^a

<u>Year</u>	<u>Net Sales</u>	<u>Net Income</u>	<u>Total Assets</u>	<u>Total Owners' Equity</u>	<u>Common Stock Dividends</u>	<u>Number Of Common Stock Outstanding</u>
1950	1,309,528,190	307,601,913	1,471,608,633	982,017,357	240,756,214	44,996,739
1951	1,545,652,851	220,743,811	1,598,755,823	1,110,215,605	160,237,502	45,148,732
1952	1,613,035,812	224,064,550	1,730,901,002	1,280,224,262	160,685,947	45,272,869
1953	1,765,432,024	235,565,266	1,846,293,478	1,395,222,717	172,569,813	45,422,730
1954	1,709,255,247	344,386,015	1,946,072,603	1,549,590,786	250,316,054	45,523,109
1955	1,941,384,933	431,555,884	2,154,606,877	1,732,152,237	318,611,861	45,525,562
1956	1,917,353,387	383,401,308	2,363,858,921	1,940,958,213	295,875,636	45,534,030
1957	1,999,667,751	396,610,341	2,519,381,173	2,103,712,941	296,254,788	45,593,560
1958	1,858,977,191	341,248,869	2,649,129,055	2,488,598,937	274,190,409	45,731,528
1959	2,144,011,699	418,695,610	2,799,429,634	2,614,610,418	320,530,697	45,807,044
1960	2,169,863,036	381,403,345	2,948,760,036	2,769,112,173	309,551,678	45,875,031
1961	2,222,738,985	418,162,515	3,129,884,673	2,943,756,796	344,644,673	45,972,696
1962	2,436,351,631	451,600,591	2,860,614,592	2,624,328,063	344,857,403	45,983,108
1963	2,584,592,781	472,261,867	2,714,971,390	2,449,978,199	356,410,091	45,994,520
1964	2,786,459,290	471,425,843	2,382,706,657	2,065,166,094	333,490,584	46,005,480
1965	3,020,757,559	407,228,855	2,587,271,223	2,191,158,727	276,146,204	46,025,890
1966	3,185,142,065	389,118,033	2,778,444,811	2,317,350,820	264,912,330	46,075,907

^aFrank St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc. Vols. 1959 through 1967).

APPENDIX B--Continued

INTERNATIONAL BUSINESS MACHINES CORPORATION^a

<u>Year</u>	<u>Net Sales</u>	<u>Net Income</u>	<u>Total Assets</u>	<u>Total Owners' Equity</u>	<u>Common Stock Dividends</u>	<u>Number Of Common Stock Outstanding</u>
1950	214,916,717	33,301,309	299,952,591	164,253,486	11,044,169	2,763,548
1951	266,798,483	27,892,090	394,119,472	183,294,254	11,577,189	2,901,652
1952	333,728,245	29,874,541	428,228,982	200,995,963	12,172,833	3,046,641
1953	409,989,104	34,119,210	520,438,541	222,336,158	12,779,015	3,198,868
1954	461,350,278	46,536,625	565,475,154	243,328,693	15,558,278	4,098,471
1955	563,548,792	55,872,633	629,510,997	282,814,837	16,386,489	4,098,471
1956	734,339,780	68,784,510	769,049,451	331,662,189	19,937,158	5,251,118
1957	1,000,431,597	89,291,589	1,086,969,222	622,517,543	25,407,174	11,552,460
1958	1,171,788,199	126,191,858	1,261,146,905	720,221,499	30,764,992	11,849,023
1959	1,309,788,037	145,633,212	1,390,637,247	843,519,936	37,073,971	18,268,943
1960	1,436,053,085	168,180,880	1,535,365,919	972,790,470	54,852,142	18,310,954
1961	1,694,295,547	207,227,597	1,768,649,296	1,185,190,957	63,265,677	27,561,531
1962	1,925,221,857	241,387,268	2,373,858,679	1,380,600,850	82,813,720	27,678,322
1963	2,059,610,111	290,463,523	1,984,540,202	1,591,739,794	117,861,990	27,792,981
1964	3,239,359,581	431,159,766	3,309,152,915	2,254,081,123	165,964,452	35,048,259
1965	3,572,824,719	476,902,490	3,744,918,460	2,578,147,578	210,767,482	35,224,914
1966	4,247,706,091	526,130,192	4,660,778,651	3,322,630,237	230,671,168	54,448,200

^aFrank J. St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued

KANSAS GAS AND ELECTRIC COMPANY^a

Year	Net Sales	Net Income	Total Assets	Total Owners' Common Stock		Number of Common Stock Outstanding
				Equity	Dividends	
1950	14,148,116	2,858,342	64,759,995	27,579,915	1,400,000	1,550,000
1951	16,321,429	2,760,868	66,964,527	28,330,717	1,550,000	1,550,000
1952	18,786,082	3,326,994	89,195,657	35,767,828	1,750,000	1,950,000
1953	21,729,644	3,941,803	107,563,577	42,171,115	1,950,000	1,950,000
1954	24,636,629	4,696,442	111,450,961	44,084,156	2,145,000	1,950,000
1955	26,811,686	4,756,802	130,264,055	51,732,497	2,340,000	3,900,000
1956	29,913,686	5,860,534	146,778,262	59,110,785	2,584,500	4,300,000
1957	31,911,831	6,075,632	152,619,763	61,254,526	2,881,000	4,300,000
1958	33,369,908	6,474,332	157,926,694	63,624,987	3,053,000	4,300,000
1959	35,640,198	6,981,467	164,975,151	66,287,573	3,268,000	4,300,000
1960	37,009,501	7,535,468	181,505,209	77,986,660	3,877,500	4,700,000
1961	39,395,370	7,680,560	192,581,749	80,621,339	3,995,000	4,700,000
1962	43,530,277	8,100,936	199,847,861	83,488,394	4,183,000	4,700,000
1963	46,747,804	8,930,095	203,569,826	82,256,669	4,480,936	4,716,755
1964	47,600,002	9,253,400	210,572,325	85,070,050	4,999,782	4,716,755
1965	48,306,091	9,512,647	217,997,869	88,384,695	5,377,124	4,716,755
1966	52,017,911	10,074,574	242,501,431	91,883,926	5,754,466	4,716,755

^aFrank J. St. Clair, ed. Moody's Public Utility Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued
KANSAS POWER AND LIGHT COMPANY^a

Year	Net Sales	Net Income	Total Assets	Total Owners' Equity	Common Stock Dividends	Number Of Common Stock Outstanding
1950	26,747,565	4,359,326	99,862,453	43,748,300	2,336,042	4,286,316
1951	29,545,030	3,906,009	109,360,502	47,907,340	2,544,168	4,800,000
1952	32,150,142	4,401,319	118,788,115	48,408,122	2,688,000	4,800,000
1953	34,523,627	4,409,246	123,099,576	56,694,198	2,783,976	5,145,766
1954	37,121,721	5,149,476	134,077,924	57,658,242	2,283,843	5,154,368
1955	41,548,363	5,598,485	138,397,425	58,320,609	3,069,499	5,164,518
1956	46,649,191	6,887,757	148,524,392	66,928,714	3,336,921	5,716,980
1957	49,353,708	7,003,344	156,659,583	68,924,077	3,721,092	5,727,900
1958	50,968,455	7,142,444	159,807,256	70,231,059	3,901,609	5,739,408
1959	55,822,467	8,681,144	165,935,217	81,279,894	4,279,695	6,297,676
1960	58,135,302	8,630,152	173,653,522	84,227,681	4,474,911	6,307,264
1961	60,077,157	9,069,021	189,110,290	87,842,680	4,673,235	6,320,678
1962	63,630,547	9,445,969	194,416,918	91,141,775	4,869,403	6,327,418
1963	67,502,722	9,686,574	199,802,790	94,569,802	5,065,270	6,334,958
1964	70,543,443	10,664,260	208,259,307	98,927,766	5,261,809	6,343,380
1965	72,707,562	11,151,291	218,594,489	103,490,349	5,586,190	6,351,359
1966	76,846,119	11,865,424	227,778,280	108,616,933	5,908,760	6,355,848

^aFrank J. St. Clair, ed. Moody's Public Utility Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX B--Continued

PIPER AIRCRAFT CORPORATION^a

Year	Net Sales	Net Income	Total Assets	Total Owners' Equity		Common Stock Dividends	Number Of Common Stock Outstanding
				Assets	Equity		
1950	3,911,921	178,414	2,494,686	1,810,339	0	0	1,394,217
1951	5,835,088	536,075	3,680,647	2,071,132	0	0	1,394,217
1952	9,907,836	395,062	4,688,433	2,486,670	0	0	1,394,217
1953	12,481,387	321,611	5,338,983	2,634,608	0	0	1,394,217
1954	11,424,131	387,819	5,229,565	2,982,265	42,153	42,153	1,394,217
1955	16,812,804	1,400,826	7,631,505	3,685,289	337,224	337,224	1,394,217
1956	25,038,705	2,553,594	10,763,785	5,746,530	693,746	693,746	1,460,373
1957	26,615,790	2,721,681	11,937,312	7,585,144	883,067	883,067	1,460,373
1958	27,108,550	2,188,336	12,856,284	8,846,259	927,221	927,221	1,460,373
1959	34,262,898	2,781,871	15,920,956	10,700,909	927,221	927,221	1,460,373
1960	40,211,828	3,523,375	24,159,375	19,093,522	1,039,720	1,039,720	1,608,590
1961	31,409,966	854,929	21,396,485	18,768,819	1,179,632	1,179,632	1,608,590
1962	33,340,156	1,769,901	23,494,270	19,466,327	1,072,393	1,072,393	1,608,590
1963	38,090,364	2,618,052	25,995,856	21,018,445	1,072,468	1,072,468	1,609,040
1964	54,378,377	4,480,580	32,623,069	24,051,153	1,614,029	1,614,029	1,619,570
1965	69,086,308	6,197,878	36,338,881	28,098,619	2,189,196	2,189,196	1,623,030
1966	81,312,624	6,870,637	48,881,803	32,607,741	2,438,659	2,438,659	1,628,050

^aFrank J. St. Clair, ed. Moody's Industrial Manual (New York: Moody's Investor's Service, Inc., Vols. 1959 through 1967).

APPENDIX C

WHOLESALE PRICE INDEX
 Industrial Commodities
 (1957-1959 = 100)

<u>Year</u>	<u>Machinery and Equipment^a</u>
1950	72.5
1951	79.4
1952	81.1
1953	82.1
1954	83.2
1955	85.7
1956	92.0
1957	97.5
1958	100.0
1959	102.1
1960	102.9
1961	102.9
1962	102.9
1963	103.1
1964	103.8
1965	105.0
1966	108.2

^a Board of Governors of the Federal Reserve System, Federal Reserve Bulletin, ILV, No. 12 (December, 1959), p. 1540 for years 1950-1958; LIII, No. 8 (August, 1967), p. 1424 for years 1958-1966.

APPENDIX D

GROSS NATIONAL PRODUCT
(Billions of 1958 dollars)

<u>Year</u>	<u>Gross National Product^a</u>
1950	355.3
1951	383.4
1952	395.1
1953	412.8
1954	407.0
1955	438.0
1956	446.1
1957	452.5
1958	447.3
1959	475.9
1960	487.7
1961	497.2
1962	529.8
1963	551.0
1964	581.1
1965	616.7
1966	652.6

^aU. S. Department of Commerce, Office of Business Economics,
The National Income and Product Accounts of the United States, 1929-
1965, p. 4-5.

BIBLIOGRAPHY

- Adelman, M. A. "The Measurement of Industrial Concentration," The Review of Economics and Statistics, XXXII, No. 4 (November, 1951), 269-296.
- Amling, Frederick. Investments: An Introduction to Analysis and Management. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965.
- Ansoff, H. Igor. Corporate Strategy. New York: McGraw-Hill Book Company, 1965.
- Babson, Thomas E., and Babson, David L. Investing for Successful Future. New York: Macmillan Co., 1959.
- Badger, Ralph E., and Coffman, Paul B. The Complete Guide to Investment Analysis. San Francisco: McGraw-Hill Book Co., 1967.
- Baumol, William J. Business Behavior, Value and Growth. New York: Macmillan Co., 1959.
- Bernstein, Peter L. "Growth Companies Vs. Growth Stocks," Readings in Investments. Edited by Richard E. Ball. Boston: Allyn and Bacon, Inc., 1965.
- Blomstrom, Robert L., and Davis, Keith. Business and Its Environment. St. Louis: McGraw-Hill Book Company, 1966.
- Board of Governors. Federal Reserve Bulletin. Washington, D.C.: The Federal Reserve System, 1959, 1967.
- Bossons, John, Cohen, Kalman J., and Reid, Samuel R. "Growing from Within May Pay Off Faster," Business Week, September 17, 1966.
- Bowyer, Jr., John W. Investment Analysis and Management, 3d ed. revised. Homewood, Ill.: Richard D. Irwin, Inc., 1966.
- Buckley, Julian G. "A Method of Evaluating Growth Stocks," The Financial Analysts Journal, XVI, No. 2 (March-April, 1960), 19-21.
- Cohen, Jerome B., and Zinbarg, Edward D. Investment Analysis and Portfolio Management. Homewood, Ill.: Richard D. Irwin, Inc., 1967.
- Drucker, Peter F. The Practice of Management. New York: Harper and Brothers Publishers, 1954.

- Edwards, Ronald S., and Townsend, Harry. Business Enterprise: Its Growth and Organization. New York: St. Martin's Press, 1958.
- Ekeblad, Frederick A. The Statistical Method in Business. New York: John Wiley and Sons, Inc., 1959.
- Freund, John E., and Williams, Frank J. Elementary Business Statistics: The Modern Approach. Englewood Cliffs: Prentice-Hall, Inc., 1966.
- Hayes, Douglas A. "Some Reflections on Techniques for Appraising Growth Rates," Financial Analysts Journal, XX, No. 4, (July-August, 1964), 96-101.
- Hicks, Herbert G. The Management of Organizations. St. Louis: McGraw-Hill Book Co., 1967.
- Jamison, Charles L. Business Policy. New York: Prentice-Hall, Inc., 1953.
- Kisor, Jr., Manown. "The Financial Aspects of Growth," Financial Analysts Journal, XX, No. 2 (March-April, 1964).
- McLean, John G., and Haigh, Robert Wm. "How Business Corporations Grow," Harvard Business Review, XXXII, No. 4 (November-December, 1954).
- Mills, Frederick C. Statistical Methods, 3d Ed. Revised. New York: Henry Holt and Company, 1955.
- Moody's Industrial Manual. Edited by Frank J. St. Clair. Vols. 1959-1967. New York: Moody's Investors Service, Inc.
- Moody's Public Utility Manual. Edited by Frank J. St. Clair. Vols. 1959-1967. New York: Moody's Investors Service, Inc.
- Mudgett, Bruce D. Index Numbers. New York: John Wiley and Sons, Inc., 1951.
- O'Keefe, James, and Warner, Jonathan S. Invest in Growth. Great Barrington, Mass.: Investors Information Service, 1965.
- Plum, Lester V. Investing in American Industries. New York: Harper and Brothers, 1960.
- Powlison, Keith. "Obstacles to Business Growth," Harvard Business Review, XXXI, No. 2, (March-April, 1953).

Selznick, P. "Foundations of the Theory of Organization," American Sociological Review, XLIII (1948), 25-35.

Slichter, Sumner H. Economic Growth in the United States. Baton Rouge: Louisiana State University Press, 1961.

Solo, Robert A., Economic Organization and Social Systems. Kansas City: The Bobbs-Merrill Company, Inc., 1967.

Standard and Poor's. New York: Standard and Poor's Corporation.

Turabian, Kate L. A Manual for Writers of Term Papers, Theses, and Dissertations. Phoenix Books. Chicago: University of Chicago Press, 1967.

U. S. Department of Commerce, Office of Business Economics, The National Income and Product Accounts of the United States, 1929-1965.

Value Line Investment Survey. New York: Arnold Bernhard and Co., Inc., 1967.

Walker, Franklin V. Growth, Employment and the Price Level. Englewood Cliffs: Prentice-Hall, Inc., 1963.

Webster's New International Dictionary. 2nd ed. revised. unabridged. Edited by W. A. Neilson. Springfield, Mass.: G. & C. Merriam Co., 1950.

Weiner, Jack B. "What Makes a Growth Company," Duns Review, Vol. 84 (November, 1964).

Young, Robert B. "Keys to Corporate Growth," Harvard Business Review, XXXIX, No. 6 (November-December, 1961).

EVALUATION OF THE QUANTITATIVE
GROWTH OF A COMPANY

by

EDWARD LOYD TURNER

B. S., Kansas State University, 1966

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Commerce

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1969

ABSTRACT

This study was undertaken to expand upon the existing theories of the quantitative growth of a company. A majority of the theories previously published investigated company growth in three basic areas, qualitative, quantitative, and combined qualitative and quantitative. This study reviews some of the theories presented in the combined qualitative and quantitative, and quantitative areas.

The literature review indicated that all previous studies had at least one of the following deficiencies: creation of the problem of divergent trends, utilization of too few accounting terms, use of subjective components or use of actual dollar value data. The deficiencies of each author's study were indicated, discussed, and comparisons between studies were made.

The purpose of this study was to formulate a model which could be used to measure the overall quantitative growth of a firm. This growth index model utilized seven quantitative growth characteristics (net sales, net income, total assets, total owners' equity, and the ratios of net income to total assets, net income to total owners' equity and net sales to total assets) and combined these characteristics into one composite growth index. The growth index was then employed to analyze the overall quantitative growth of a company with other companies in the same industry and with the economic growth of the nation. For this study a company was considered

a growth company if its computed growth index was increasing and if its growth indices were increasing faster than the national economy's.

The growth indices were a summation of seven components or characteristics which were in index number form. The index numbers were constructed from constant dollar data. A total of seventeen years of data was selected with 1950 being selected as the base year for the index numbers. Growth indices for eight test companies were calculated and compared to the growth of the national economy as measured by gross national product in constant dollars. The slope of the line formulated by using the national economy's growth indices as the independent variable and the company's calculated growth index as the dependent variable determined the company's rate of growth over the national economy's. A growth company's indices must be increasing at a rate as fast as the rate of growth of the national economy in order to achieve at least natural growth. Natural growth was obtained if the slope of the linear regression line was one or greater. Some companies were evaluated with the other companies within the same industry. This analysis was done for three aircraft companies in the light aircraft industry.

A comparison was made between the growth index calculated in this paper and several of the theories in the literature review. The comparisons indicated that the calculated growth index did eliminate the deficiencies encountered in the other studies. The conclusions were that the calculated

growth index did indicate the quantitative growth of a company and did appear superior to the other theories for measuring the quantitative growth of a company.