# AN EXAMINATION OF FINANCIAL RATIOS FOR THE ASSET MANAGEMENT OF SELECTED INDUSTRIES

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## ABSTRACT

*The empirical approach in this research uses factor analysis to investigate the importance of various financial ratios in selected industries from 1972 through 1981 as reported in the Compustat Database. One of the main conclusions is that financial ratios do not differ significantly in importance among the industries studied. However, their relative importance is not consistent within an industry group over time. This new finding indicates that past relationships cannot be used to accurately forecast future relationships.*

## INTRODUCTION

Asset management involves choosing the desirable degree of exposure to the fundamental economic risks that influence asset returns. The financial manager seeking the optimal degree of risk exposure for the firm requires an understanding of the level of risk exposure of the organization. Financial ratio analysis provides the analyst with a wide array of useful data for predictive or explanatory purposes. [See, for example, Altman (1968), Beaver (1966), Elam (1975), and Libby (1975).] By identifying the dominant forces influencing industry financial ratios over time, managers can acquire a better understanding of the mixture of real and financial assets mix that may affect stockholder wealth performance [Stevens (1973)]. The objectives of this research are to determine the type of ratios most important to selected industrial companies over time, to examine specific industries in order to observe the cross-industry stability of financial ratio patterns and to determine if the factors are stable over time within industries.

This study uses time series and cross sectional data to detect patterns in financial ratios. This approach has been used by several other researchers. Gombola and Ketz (1983b) investigated 58 financial ratios and identified 10 factors important to retail and manufacturing firms through the use of factor analysis. Their study found considerable time series stability of financial ratio patterns over a ten year period from 1971 to 1980 for both the manufacturing and retailing industries, which was in agreement with Pinches, Mingo, and Caruthers (1973), Pinches, Eubank, Mingo, and Caruthers (1975), and Johnson (1978). However, the structure of financial ratio patterns differed somewhat between retail and manufacturing firms. Their conclusion was that financial analysts should focus their attention on different financial ratios for firms in different industries.

This research extends the previous studies on financial ratios into specific industries. The number of ratios chosen for the study was small enough to eliminate redundant use of accounting data, yet sufficient to cover several main areas of interest to a financial analyst. Included in the research are liquidity, asset utilization, profitability, leverage, and market valuation ratios, as defined in the following section. The subsequent section reports the results of the cross sectional and time series analysis. The conclu-

sions of the study are summarized in the final section.

## DATA AND EMPIRICAL DESIGN

The factor analytic approach utilized in this paper allows for the determination of equity valuation forces without the need for any assumptions concerning the possible validity of any particular valuation function or the need for any decisions concerning the relative importance of specific financial indicators. This empirical method has been used to study financial ratios by several different authors; such as Chen and Shimerda (1981), Pinches, Mingo and Caruthers (1973), Pinches, Eubank, Mingo, and Caruthers (1975), Gombola and Ketz (1983a, b), and Gombola, Haskins, Ketz, and Williams (1987). Indeed, the technique makes it possible to synthesize and identify valuation forces which are present to any degree in various combinations of financial variables. The essence of the extracted valuation forces might well be a factor not explicitly included as one of the original variables and perhaps considered unlikely, or even impossible, by the investigator at the onset of his study.

As with the previously cited studies of this type, our data source is the Compustat database service, a subsidiary of Standard and Poor's Corporation. The three groups selected for the study are the paper, household appliances, and chemical industries. There are 26 corporations in the Paper Group, 12 in the Household Appliances Group and 19 in the Chemical Group. Annual financial ratios were generated for all of the corporations in each of the three industry groups for the ten year period from 1972 through 1981. The financial ratios selected for the study are as follows:

CR Current Ratio (Current Assets/Current Liabilities),
NOAT Net Operating Asset Turnover (Net Operating Assets/Sales),
ROE Return on Equity (Net Income/Common Equity),
ROA Return on Total Assets (Net Income/Total Assets),
LEV Leverage (Long Term Debt/Total Assets,
PE Price/Earnings Ratio,
DY Dividend Yield (Dividend/Price).

The correlation matrices, which provide the basis for factor analysis, were generated using Pearson's simple linear correlation model. In all cases the data reduction and transformation were accomplished by factor analysis utilizing the principal factor technique with varimax rotation. For all computer runs the factoring process was terminated after two factors were extracted. On average, the two factors accounted for approximately 60 to 65% of the common variance among the variables in each of the models.

The importance of a financial variable to the extracted valuation factors is indicated by the magnitude of the factor loadings. Factor loadings are similar to correlation coefficients. The higher the factor loading on a variable, the more important that variable is to the extracted factor.

## RESULTS OF THE STUDY

### *Pooled Time-Series and Cross Sectional Data*

Table I shows the most important factor loadings generated when the three industry classes were factored as one group over the ten year period. It was expected that this pooling of data would generate general valuation factors which would be independent of any specific industry group.

Factor I is an earnings factor related to total asset management. the value of this force is reflected in the market price of common stock. Factor II is a financial leverage factor which affects the earnings available to the common shareholder. Factor I accounts for 42% of the common variance in the model, while Factor II accounts for 33%.

### *Cross-Sectional Results*

In order to determine whether equity valuation factors are different across the three industry classes, each of the three industry groups were factored separately over the entire ten year period. The most significant results of the factoring by industry group are shown in Table II.

For the Paper and Allied Products Group, Factor I is a profitability factor related to asset management and financial leverage. It is a general earnings factor. Factor II is related to the total asset structure characteristic of this group. Factor II is an operating asset management fac-

tor which describes the level of current operating assets required to support a given level of sales. The level of long term interest rates is particularly important to this group as indicated by the Factor I loadings. Of the total variance in the original data, Factor I accounts for 39 percent and Factor II accounts for 20 percent.

For the Household Appliances Group, Factor I is an earnings factor related to total asset management. Factor II is a liquidity, or an operating asset management, factor that probably is highly sensitive to sales volume. It is related to current asset management. Notice that the Factor II loadings for this industry group are virtually the same as for the Paper Products group and therefore identify the same valuation factor. The level of short term interest rates are of prime importance to this group. Of the total variance Factor I accounts for 34 percent and Factor II 22 percent.

For the Chemicals Group, Factor I is an earnings factor related to total asset management. This is a general valuation force resulting from total asset employment. The value of this factor is not reflected in the market price of stock. Factor II is an operating level factor that has a major impact on the level of profitability of this group. This factor is related to financial leverage and, thus, is reflected in the market price of stock. The profitability of this group is probably dependent on the level of general economic activity.

This study of specific industries with general financial ratios produces somewhat different results than the Gombola and Ketz (1983b) research where broad categories (i.e., retail versus manufacturing) were investigated. All three industry groups consistently have Factor I's heavily loaded on rate of return ratios and Factor II's heavily loaded on operating asset ratios. Although the Chemical and Allied Products Industry is more closely identified with its market valuation (as indicated by the Factor II loading on the PE ratio) than on the other two industries, the factor loadings are surprisingly consistent. Financial leverage is uniquely important to the profitability factor of the Paper Products Industry. Overall, there are several factors which are significantly consistent across these three very different industries. However, there are also unique variables that are important as indicated by earlier studies.

*Time Series Results Per Industry*

In order to determine whether the extracted financial factors are different among years within each of the three industry groups, each group was factored by year on the seven variables. The main factor loadings for the two extracted factors for each of the ten year periods are shown in Tables III, IV and V. These tables are reported so that the reader can observe the variability of the factor loadings over time. Factor loadings are similar to correlation coefficients. The higher the factor loading on a variable the greater is the relationship of that variable to the extracted valuation factors. [See, for example, Harmon (1976).]

As Table III indicates, the factor loadings of the variables for both factors in the Paper and Allied Products Industry are different among years over the ten year period. For each year, however, return on total assets and return on equity are important valuation forces for the paper industry.

As Table IV indicates, the factor loadings on the variables for the Household Appliances Industry are different among the years over the ten year period. Once again, return on total assets and return on equity are important valuation influences on the extracted factors, but at varying amounts over time.

The factor loadings on the variables in Table V vary among the years. Return on assets and return on equity are important valuation forces for the Chemical and Allied Products Industry, as they were for the other two industry groups.

It was surprising to find such variation in factor loadings among years within each industry group. We are using annual data and, of course, market forces and investor expectations need not operate within one accounting year. However, for these time periods and these three industry groups, the underlying valuation forces differed across the years within each industry group.

## SUMMARY OF FINDINGS

For each of the three industry groups considered, the extracted factor loadings vary among

years within each of the three groups. The valuation forces within each group are considered not to be independent of the year. This result differs from that of Gombola and Ketz (1983) which indicated stability of valuation forces over time.

When each industry group is factored over the entire ten year period the extracted factor loadings are not very different among industry groups. The extracted factors are named as follows:

Paper Products

Factor I Expected Earnings
Factor II Operating Asset Management

Household Appliances

Factor I Expected Earnings
Factor II Operating Asset Management

Chemicals

Factor I Expected Earnings
Factor II Total Asset Management

When the three groups are combined and factored as one group over the ten year period more general factor loadings are extracted. These factors are named as follows:

All Three Industries Combined

Factor I Expected Earnings
Factor II Financial Leverage

These findings indicate that additional research needs to be done on the study of financial ratios. Analysts can use a small number of financial ratios when doing financial analysis in order to compare companies' performance cross-sectionally. However, past financial patterns may not accurately predict future financial ratio relationships.

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Table I

Factor Loadings of Combined Groups

| Factor I | | Factor II | |
|---|---|---|---|
| ROA | .84 | LEV | .79 |
| ROE | .95 | | |

Table II

Industry Classification Factor Loadings for the 10 Year Period

(1972-1981)

Paper and Allied Products (n=260)

| Factor I | | Factor II | |
|---|---|---|---|
| ROA | .98 | NOAT | .81 |
| ROE | .83 | CR | -.69 |
| LEV | -.69 | | |

Household Appliances (n=120)

| Factor I | | Factor II | |
|---|---|---|---|
| ROA | .91 | NOAT | .85 |
| ROE | .79 | CR | -.77 |

Chemicals and Allied Products (n=190)

| Factor I | | Factor II | |
|---|---|---|---|
| ROA | .91 | NOAT | -.76 |
| ROE | .90 | PE | .69 |
| | | LEV | .63 |

Table III

Factor Loadings: Paper and Allied Products (n=26)

| Factor I | Factor II | Factor I | Factor II |
|---|---|---|---|
| 1972 | | 1977 | |
| ROA .95 | NOAT .87 | ROA .80 | FOE .93 |
| LEV -.83 | DY -.73 | NOAT-.75 | DY -.87 |
| ROE .79 | | LEV -.74 | |
| | | PE .61 | |
| 1973 | | 1978 | |
| NOAT .82 | ROA .89 | ROA .95 | NOAT -.84 |
| PE -.67 | ROE .83 | ROE .89 | CR .77 |
| | | DY -.70 | PE .64 |
| 1974 | | 1979 | |
| ROA .94 | PE .79 | ROE .88 | DY .83 |
| LEV -.84 | DY -.77 | ROA .85 | PE .73 |
| ROE .70 | CR .76 | LEV -.74 | |
| | | CR -.67 | |
| | | NOAT .64 | |
| 1975 | | 1980 | |
| ROA .94 | DY .80 | ROE .91 | CR .82 |
| ROE .85 | CR .60 | ROA .89 | LEV .78 |
| LEV -.77 | | DY -.72 | NOAT -.71 |
| | | PE -.70 | |
| 1976 | | 1981 | |
| ROA .96 | NOAT .80 | ROA .97 | DY .73 |
| ROE .92 | DY .78 | ROE .91 | CR -.71 |
| LEV -.81 | | | PE .62 |

Table IV

Factor Loadings: Household Appliances (n=12)

| Factor I | Factor II | Factor I | Factor II |
|---|---|---|---|
| 1972 | | 1977 | |
| ROA .96 | PE .93 | NOAT -.89 | ROA .95 |
| ROE .82 | DY -.89 | CR .77 | LEV -.82 |
| LEV -.80 | | DY .70 | |
| CR .70 | | ROE -.68 | |
| | | PE .64 | |
| 1973 | | 1978 | |
| ROE .92 | CR .93 | CR .81 | ROA .90 |
| LEV -.89 | NOAT -.73 | NOAT -.77 | ROE .83 |
| ROA .85 | | PE .75 | |
| PE .80 | | LEV -.70 | |
| 1974 | | 1979 | |
| ROA .93 | LEV .77 | ROA .85 | DY .86 |
| CR .83 | PE -.75 | PE .84 | NOAT -.64 |
| ROE .68 | ROE .62 | ROE .81 | |
| | | CR .64 | |
| | | LEV -.62 | |
| 1975 | | 1980 | |
| ROA .96 | NOAT .95 | ROE .93 | CR .89 |
| ROE .75 | DY -.82 | PE -.78 | NOAT -.75 |
| LEV -.66 | | ROA .78 | DY .62 |
| PE .64 | | LEV -.60 | |
| 1976 | | 1981 | |
| ROE .89 | ROA .80 | PE .95 | CR .92 |
| DY -.72 | CR .78 | ROE .87 | LEV -.76 |
| PE -.65 | LEV -.70 | DY -.71 | ROA .68 |
| NOAT .65 | | ROA .71 | ROA .68 |
| | | | NOAT -.63 |

Table V

Factor Loadings: Chemical and Allied Products (n=19)

| Factor I | | Factor II | | Factor I | | Factor II | |
|---|---|---|---|---|---|---|---|
| | 1972 | | | | 1977 | | |
| DY | -.86 | NOAT | .96 | ROE | .88 | NOAT | -.88 |
| PE | .85 | LEV | .74 | ROA | .86 | LEV | .85 |
| ROA | .81 | | | | | | |
| ROE | .80 | | | | | | |
| | 1973 | | | | 1978 | | |
| DY | -.92 | LEV | .91 | ROA | .80 | NOAT | .91 |
| PE | .83 | NOAT | -.80 | PE | .80 | LEV | -.91 |
| ROE | .76 | | | DY | -.63 | | |
| ROA | .60 | | | ROE | .61 | | |
| | 1974 | | | | 1979 | | |
| ROE | .88 | NOAT | .88 | ROA | .84 | DY | .86 |
| DY | -.75 | LEV | -.60 | LEV | -.75 | PE | -.70 |
| ROA | .74 | | | | | | |
| | 1975 | | | | 1980 | | |
| ROA | .93 | DY | .82 | ROA | .96 | FY | .83 |
| ROE | .92 | NOAT | .76 | PE | -.89 | CR | .72 |
| PE | -.74 | LEV | -.74 | ROE | .88 | NOAT | -.68 |
| | 1976 | | | | 1981 | | |
| PE | -.86 | NOAT | .79 | ROA | .89 | CR | .69 |
| ROA | .83 | LEV | -.74 | ROE | .80 | PE | -.65 |
| ROE | .75 | DY | .72 | LEV | -.64 | DY | .61 |
| | | | | NOAT | .62 | | |