A RESEARCH METHODOLOGY TO MEASURE THE PROFITABILITY OF REGULATED PUBLIC UTILITIES

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Abstract

The study focuses on examining the impact of regulatory climate, among other things, upon the regulated firms profitability measurement and development of a statistical analyses and procedures to measure correctly such regulatory impact. The discussion of analytical results was grouped into three clusters to include comparison between deregulated and regulated industry. The clearest finding was profit margins declined when an industry was deregulated, and other element of the theory, such as changes in asset turnover rate and equity multiplier were not supported by the results.

I. INTRODUCTION

The existence of an optimal methodology to measure profitability of regulated firm's specially Electric Public Utility's remain an unresolved issue in Corporate Finance.

The literature on the measurement of profitability of the regulated firm is less extensive, but no less irresolute. To date most of the theoretical and empirical work (See, Gordan (1967), Elton & Gruber (1971), Juffe and Mandaker (1976), Robert Trent (1979), Stephen Archer (1981) and Jeffery A. Dubin and Peter Navarro (1983)) has dealt primarily with the regulatory effect on cost of capital in Electric utility. Robert Trent, for example, found that regulatory climate increased the cost of capital to Electric utilities in 1976 by 192 percentage points, and, Dubin and Navarro found the increase to be 228 percentage points in 1977.

A factor which has been somewhat ignored in earlier work is the impact that different regulatory climates might have upon a regulated firm's profit structure and the correct way of its measurement.

The main purpose of this paper is to fill this void: that is, rather than attempting to determine what constitutes an optimal profitability structure, the study focuses on examining the impact of regulatory climate, among other things, upon the regulated firms profitability measurement and development of a statistical analysis and procedures to measure correctly such regulatory impact.

The Organization of the Study

The remainder of this paper consists of five sections. Section II provides a discussion of the parameter and variables used in the study. Section III, is composed of the development of hypothesis sets and re-estimation procedures used for their testing. Section IV focuses on analyses and methodology, development for measurement of profitability for selected public utilities. Section V presents the empirical results and conclusions.

II. DISCUSSION OF VARIABLES

When industries are deregulated,

their profit margins generally decrease, and they maintain their profitability by leveraging their assets. Primarily, the notion of profitability is measured by return on equity (i.e., net income divided by equity, where equity is the cash value of the stock of each particular firm). The leveraging of assets is measured by asset turnover (i.e., revenue divided by total assets). In addition to the primary measures there are two additional measures which are worth mention. Return on investment is mentioned as a somewhat inferior measure of profitability and is considered to have minor importance in the theoretical framework. The equity multiplier (i.e., assets divided by equity) is a secondary measure of leveraging wherein the greater the leveraging, the higher the equity multiplier.

These variables comprise the data base which has a fairly complex structure. That is, data, collected for this study, are annual profit summaries for firms in several industries primarily the six largest investor-owned Electric utilities in the Atlantic region and the selected firms in the savings and loan and trucking industry and are collected over a ten-year period. Many of the industries were deregulated in the course of the decade. These firms were drawn from six different industries so as to provide a broad baseline to compare with the electric utility companies. It is assumed that this structure be simplified by restricting analysis to three industries: electric utilities, trucking, and the savings and loan industry. The trucking and savings and loan industry were deregulated in the same year, 1980, which simplifies analyses involving these industries and creates a naturalistic experiment with which the effect of deregulation can be assessed. Since the electric utility companies remained under regulation during this period, in this experiment, they provide a control group to help assess the effect of deregulation. Inclusion of the additional industries would require a host of different analyses on different industries with different comparison points in time and would produce a hodgepodge of hard-to-interpret evidence.

Industries such as oil, gas and banking were not deregulated in 1980, so it becomes very difficult to develop statistical analyses which can compare regulated and deregulated industries using variables representing specific years. Using only three industries provides a straightforward test of the theoretical orientation implicit in this paper in a way that can be easily understood by the readers.

III. DEVELOPMENT OF HYPOTHESES

From this line of argument and redefined data structure seven sets of hypotheses has been generated. These hypotheses are stated below and given labels which are referenced in the analysis section of the report.

Set 1. The first hypothesis is concerned with the effect of deregulation on margins of profit. That is, the introduction of deregulation is assumed to produce a reduction in profit margins. This general proposition results in the following specific hypotheses:

Set 2. The deregulation of an industry will also lead to an increase in the leveraging of the assets of that industry. This general component of the argument leads to the following hypotheses: *2a.* The asset turnover rate will increase when an industry has been deregulated; *2b.* The asset turnover rate will remain constant for the industries that were not deregulated; *2c.* The asset turnover rate of deregulated industries will be higher than the rate of regulated industries during the period after deregulation.

Set 3. The effect of deregulation on the equity multiplier parallels that of the effect on asset turnover rate. Thus the following hypotheses apply to this measure: *3a.* The equity multiplier

will increase when an industry has been deregulated; *3b.* The equity multiplier will remain constant for the industries that were not deregulated; *3c.* The equity multiplier of deregulated industries will be higher than the multiplier for regulated industries during the period after deregulation.

Set 4. One important component of the argument is that profitability will stay constant when industries are deregulated. The reason for this is that the decline in profit margin leads to more effective use of assets through leveraging. The following hypotheses spring from the fact that deregulation will not lead to an overall decline in profitability as measured by the return on equity. *4a;* For the industries that undergo deregulation, return on equity before deregulation will not be different from return on equity after deregulation; *4b.* Similarly, the control industry (electric utilities) will not be effected by the deregulation of the other industries; *4c.* The profitability of the deregulated industries will not differ from the profitability of the regulated industry when pre-deregulation profitability is controlled for.

Set 5. Since return on investment and return on equity both measure profitability, it is expected that they will rise and decline together. This circumstance leads to a single hypothesis: *5a.* The two measures of profitability (return on equity and return on investment) will be positively correlated.

Set 6. In a similar vein, asset turnover and the equity multiplier are each a measure of leveraging. Hence it is expected that these two measures would also vary together; *6a.* There will be a positive correlation between the two measures of leveraging, asset turnover and equity multiplier.

Set 7. Since there is a tradeoff between profit margin and leveraging. When profit margin drops through deregulation, firms are forced to leverage their assets. Hence the amount of profitability is a function of both the profit margin and the degree of leveraging; *7a.* Return on equity is a function of both margin of profit and asset turnover rate; *7b.* Return on equity is a function of both margin of profit and the equity multiplier.

IV. ANALYSES, LIMITATIONS, AND METHODOLOGY SELECTION

In the previous section seven sets of hypotheses were presented. In that discussion, the organization of the hypotheses reflected the line of argument presented in the study. Since many of the hypotheses can be examined using the same statistical tests, discussion is simplified by reorganizing the hypotheses into groups which are subject to similar analysis. This section follows such an organization.

In the presentation of each of the analyses, two types of information are provided: (1) a rationale for using the statistical test being proposed; and (2) limitations on the statistical test will be described were required.

One caveat deserves mention before presentation of the individual analyses commences. The complexity of the data allows for the correct use of a large number of different types of analyses. As a result, there will never be clear agreement among analysts on the "best" way to treat these, or any, data. The techniques presented here are recommended for two reasons: first because they are designed to answer the questions implicit in the study's line of argument, and second because they are not too complex to interpret. Hence it is possible that a reviewer could recommend alternative methods of analysis. This should not be taken to mean that recommendations made here are in some sense incorrect.

The first type of analysis tests a great many of the hypotheses (1a, 1b, 2a, 2b, 3a, 4a, 4b). These hypotheses

are similar in that they compare variables before and after the 1980 deregulation. These hypotheses are also conducted for each industry separately with the result that the sample size for the analysis is restricted to the number of firms in the industry being considered. Therefore, special consideration must be given to the small size of each sample.

The approach used to test each of these hypotheses requires that two scores be computed for each firm, one which represents the level of functioning prior to 1980 and another representing the level after 1980. The pre-deregulation score for a firm can be computed by averaging the performance for 1977, 1978 and 1979. Similarly, a post-deregulation score could be calculated by averaging 1981, 1982 and 1983. For example, the margin of profit during the pre-deregulation period for each firm in the trucking industry could be calculated by averaging the values for 1977, 1978 and 1979. Similarly, a post-deregulation score could be computed for each of the firms in the trucking industry by averaging their margins of profit during 1981, 1982 and 1983.

Once these scores are computed for each firm in each industry, the pre-scores can be compared with the post-scores for each variable using a Wilcoxon matched-pairs, signed ranks test (Siegel, 1956:77-83). This test is ideal because it is a nonparametric test not requiring a large sample size.

Although there are no particular limitations in connection with the validity of the Wilcoxon test, the relatively small sample sizes mean that each of the tests requires very large pre- post changes to be statistically significant. This is not a property of the test per se. Rather, it results from the fact that relatively few firms were available from each industry.

The next set of analyses compares the functioning of the regulated with the deregulated industries during the time after deregulation (hypotheses 1c, 2c, 3c, and 4c). That is, this type of analysis is used to compare the combined trucking and savings and loan industries with the electric utility industry. Since information concerning the performance of each firm prior to deregulation is also available, it can be used to control for initial levels of performance.

This analysis also requires that a pair of variables be computed for each firm. One variable in the pair measures pre-deregulation performance while the other measures post-deregulation performance. Performance prior to deregulation is calculated by averaging the performance of a firm on a given measure over the years 1977, 1978 and 1979. Likewise, performance after deregulation can be obtained by averaging the three post-deregulation years for each variable. Thus, these analyses employ the same variables used in the first set of analyses with the exception that industries are analyzed together instead of separately.

The way the variables are employed is completely different. In the first set of analyses, each firm was analyzed separately comparing the pre- and post-deregulation performance. In this set of analyses, the trucking, savings and loan and electric utilities firms are combined into a single analysis. This allows a comparison to be made between the pooled industries of trucking and savings and loan with the electric utilities industry during the deregulation period. The pre-deregulation scores are used as a control for the effect of pre-deregulation performance levels.

Analyzing all three industries simultaneously increases the sample size and enables the use of parametric statistical tests. For each of the hypotheses an Analysis of Covariance is used to compare the performance of the three industries in the time of post-de-

regulation controlling for pre-deregulation values. However, in order to make the specific comparison between the pooled, deregulated industries (trucking and savings and loan) with the regulated utilities industry, a contrast for mean comparisons must be employed. That is, while the original analysis of covariance tests to see if there are any differences between the three industries under consideration, it does not indicate if the deregulated industries are different from the regulated industries. The contrast for mean comparisons is used to test this question.

Unlike the wilcoxon test, the Analysis of Covariance (ANCOVA) requires that a series of assumptions concerning the data be met. These assumptions set limitations on the use of the test. ANCOVA requires the variables to be normally distributed, the groups to have equal variances, the covariate to be linearly related to the dependent variable, and that the same linear relationship be present in all groups.

The third set of analyses test hypotheses 5a and 6a which require a test of the correlation between pairs of post-deregulation variables. Specifically, for hypothesis 5a return on equity will be correlated with return on investment and for hypothesis 6a asset turnover will be correlated with the equity multiplier. Once gain, all three industries are analyzed simultaneously. However, for this analysis a problem arises in connection with the comparability across industries which requires a correction prior to executing the correlation phase of the analysis. When data are obtained form multiple groups a correction should be imposed to remove the effect created by the fact that the data come from different groups. In this case, the effect is removed by subtracting the appropriate industry mean from each firm's score. Thus, four new variables must be created before computing the correlation coefficients: Return on equity minus the industry mean for return on equity; return on investment minus the industry mean for return on investment; asset turnover minus the industry mean for asset turnover; and equity multiplier minus the industry mean for equity multiplier. For example, the mean of return on equity for the trucking companies would be subtracted from the return on equity score for each of the trucking companies, and then the process is repeated for savings and loan firms and utilities. The resulting variables would include the adjusted score for each firm in all three industries.

The final set of hypotheses is in some sense an expansion of the analyses explained above. While prior analyses involved the correlation between pairs of variables, in the present case, interest is focused on the relationship between one variable and a set of other variables. Specifically, in hypothesis 7a return on equity is presumed to be a function of margin of profit and asset turnover rate. Hypothesis 7b is similar to 7a in that return on equity is seen as a function of margin of profit an equity multiplier.

Both of these hypotheses have been tested using Multiple Regression Analysis. Once again the variables used in the analysis are consist of average performance over three years in the post-deregulation period. Also similar to prior analyses, the problem of comparability across industries must be taken into account. The multiple regression analysis must explicitly handles the inclusion of grouping variables, such as the distinction among industries, required by this analysis. It allows for the testing of the hypothesis that the same functional relationship between the independent variables and the dependent variable exists for each industry being considered.

V. FINDINGS OF THE STUDY

The analyses were restricted to three industries: trucking, savings and

loan, and electric utilities. The restriction permitted an analytical evaluation of a natural experiment. Since both the trucking and savings and loan industries were deregulated in the same year, these two industries could be compared to the electrical utility industry which was not deregulated. This circumstance provided a means to investigate the effect of deregulation on several dependent variables.

For clarity of discussion, the hypotheses are grouped into three clusters. The first cluster contains hypotheses one through four. These are concerned with two facets of the theory: (1) changes over time in dependent variables for specific industries; and (2) the comparison of regulated and deregulated industries.

The second cluster contains hypotheses five and six. They sought to evaluate the correlation between several dependent measures pooled over industrial types.

The third and final cluster contains hypothesis seven which is concerned with predicting return on equity using multiple predictor variables.

Cluster I

This cluster contains hypotheses one through four. Each of these is concerned with two questions: First, for each of the industries, is there a change that occurs following the time of deregulation? Second, when comparing industries in the post- deregulation period, is there a difference between the deregulated and the regulated industries controlling for pre-deregulation levels of the dependent variable? The four hypotheses are examined for four dependent variables: (1) profit margins; (2) asset turnover rates; (3) the equity multiplier; and (4) return on equity.

Hypothesis 1. The first hypothesis is concerned with the effect of deregulation on margins of profit. That is, the introduction of deregulation is assumed to produce a reduction in profit margins. This general proposition results in the following specific hypotheses: 1a.Margins of profit will decline for the industries that are deregulated; 1b. During the same period, profit margins will not decline for the industries which are not deregulated; 1c. Profit margins of deregulated industries will be lower than the margins of regulated industries for the same time period.

Hypothesis 1a was tested separately on the trucking and S&L industries. For the trucking industry, the profit margin prior to deregulation was 3.07 and was 3.79 following deregulation. This difference was not significant using the Wilcoxon Matched-Pairs Signed-Ranks Test. For the S&L industry the pre-profit margin rate was 10.56 and the post-rate was -.138. Again a Wilcoxon was computed. The resulting Z statistics was -1.83. This was significant at the .05 level using a one-tailed test. Hence, the S&L industry exhibited a significant declining profit margin, supporting hypothesis 1a, while changes in trucking industry profit margins did not support the hypothesis.

In hypothesis 1b no decline was predicted for the electric utilities when comparing these two periods. This was indeed found to be the case. Prior to deregulation the mean was 9.83, while after deregulation it rose to 10.53. This difference was not significant.

Hypothesis 1c is the most crucial to the theory since it compares the deregulated and regulated industries during the deregulation period. This type of design is much stronger than the pre-post designs of hypotheses 1a and 1b. The analysis of covariance (ANCOVA) was used to see if there were any differences in profit margins during the post period, controlling for profit levels occurring in the pre period. As stated previously the post period means were 3.79, -.38, and 10.53 for the three industries. The overall

F-test indicated that the three industries were in fact behaving differently ($F = 26.45$; $df = 2.15$; $p < .001$). Furthermore a specific contrast was performed which compared the two deregulated industries with the utilities. This contrast also showed a significant difference ($t = 5.16$, $df = 15$; $p < .001$) indicating that the utilities had higher profits than the two deregulated industries when initial levels of profitability were taken into account. These results strongly support the theory that deregulation reduces profit margins.

Hypothesis 2. The deregulation of an industry will also lead to an increase in the leveraging of the assets of that industry. This general component of the argument leads to the following hypotheses: *2a.* The asset turnover rate will increase when an industry has been deregulated; *2b.* The asset turnover rate will remain constant for the industries that were not deregulated; *2c.* The asset turnover rate of deregulated industries will be higher than the rate of regulated industries during the period after deregulation.

The results for hypotheses 2a and 2b do not support the theory. Both deregulated industries had no significant change in Asset Turnover Rate (ATR) while the regulated industry showed a significant increase! The trucking industry had ATRs of 2.67 and 2.73 yielding a non-significant Wilcoxon statistic. Similarly, the S & Ls had ATRs of .13 and .10, again yielding a non-significant Wilcoxon statistic. On the other hand, the utilities had pre and post ATRs of .33 and .44 which were significantly different $f(Z = 2.2$; two-tail $p < .05)$.

Hypothesis 2c was tested using an Analysis of Covariance design similar to the testing described for hypothesis 1c. The results showed that there were no overall differences between the three industrial groups and no difference between the regulated and deregulated industries.

Hypothesis 3. The effect of deregulation on the equity multiplier (EM) parallels that of the effect on asset turnover rate. Thus the following hypotheses apply to this measure: *3a.* The equity multiplier will increase when an industry has been deregulated; *3b.* The equity multiplier will remain constant for the industries that were not deregulated; *3c.* The equity multiplier of deregulated industries will be higher than the multiplier for regulated industries after deregulation.

The equity multiplier showed no differences over time and no differences between industries. For the trucking, S & Ls and utilities there were no significant differences between pre-deregulation and post-deregulation EMs (3a and 3b). Also, the analysis of covariance showed no significant differences between the three industries during the post-deregulation period, and the specific contrasts comparing the two deregulated industries with the utilities showed no significant differences (3c).

Hypothesis 4. One important component of the argument is that profitability will stay constant when industries are deregulated. The reason for this is that the decline in profit margin leads to more effective use of assets through leveraging. The following hypotheses spring from the fact that deregulation will not lead to an overall decline in profitability as measured by the return on equity. *4a.* For the industries that undergo deregulation, return on equity before deregulation will not be different from return on equity after deregulation. *4b.* Similarly, the control industry (electric utilities) will not be effected by the deregulation of the other industries. *4c.* The profitability of the deregulated industries will not differ from the profitability of the regulated industry when pre-deregulation profitability is controlled for.

The essence of hypothesis four is

that deregulation has no effect on return on equity (ROE). While specific hypotheses testing this notion were not in fact upheld by the data, the results do not necessarily contradict the rationale underlying them. The underlying proposition that deregulation has no effect on ROE is in fact confirmed. Specifically, hypothesis 4a predicts that neither trucking nor S&Ls will have any significant change in ROE when comparing the pre- and post-deregulation periods, and when the Wilcoxon test was performed for each of these industries, no significant differences were found. However, hypothesis 4b predicted that there would be no differences between the pre and post periods for the utilities. In actual fact, ROE increased from 8.19 to 11.52 which was significant ($Z = 2.20$; $p < .05$). Since the utilities were not deregulated, the change observed in this industry was not due to deregulation.

The results from the analysis of covariance indicate that the three post deregulations means were significantly different when controlling for predereg-ulation levels. The means of the three industries were 16.98 (trucking), -4.04 (S & L), and 11.52 (utilities) and these were found to be significantly different ($F = 9.40$; $df = 2,15$; $p < .01$). However, the specific contrasts that compared the two deregulated industries with utilities was not Significant, indicating that although there were significant differences, they were not due to deregulation.

Summary of Cluster 1. The theorized relationship between profit margins and deregulation was supported by the results. The analysis of covariance and the accompanying post-hoc contrasts indicated that there were significant differences between the profit margins of the regulated and deregulated industries controlling for the effect of pre-deregulation levels. The theory's assertion that Asset Turnover Rate and Equity Multiplier would be increased by deregulation was not supported in the data. This lack of confirmation occurred both during pre-post comparisons for specific industries and during the comparison of regulated and deregulated industries. The fourth hypothesis that ROE would not be effected by deregulation was supported by the ROE did change from other causes.

Cluster 2

The second cluster contains hypotheses five and six. These hypotheses are concerned with the relationships between two pairs of variables: the correlation of return on equity with return on investment and the correlation of asset turnover rate and the equity multiplier. As described earlier, these correlations should be calculated after removing the effect of industry type. This requires that four variables be created. In each case the mean for the industry on that particular variable must be subtracted from the variable to create a new variable which is adjusted for industry.

The correlations were recalculated for each industry using a non-parametric correlation coefficient such as Spearman's Rho or Kendall's Tau since these are more appropriate for small sample sizes. Since there correlations are motivated to the line of argument presented in hypotheses one through four; the correlation has simply been left our of the analysis.

Cluster 3 Hypothesis Cluster 3 contained only hypothesis 7.

Hypothesis 7. The heart of the theory presented is that there is a tradeoff between profit margin and leveraging. When profit margin drops through deregulation, firms are forced to leverage their assets. Hence the amount of profitability is a function of both the profit margin and the degree of leveraging. These rationales prompted the following two hypotheses: *7a.* Return on equity is a function of both margin of profit and asset turnover rate; *7b.* Re-

turn on equity is a function of the margin of profit and equity multiplier.

Since both of the hypotheses involve predicting a single dependent variable from multiple independent variables, all of which are continuous in nature, the basic tool for the analyses is multiple regression. Multiple regression in general does not take into account a grouping structure such as type of industry. Hence, specialized software was employed to account for this special factor. The BMDP program 1R returns three types of output when a multiple regression equation is entered with a grouping factor. First, there is an overall regression equation which ignores the grouping factor completely. Second, there is an equation developed for each of the groups separately. In this case, a separate equation was developed for each industry. Third, there is a comparison of the models which allows the researchers to evaluate the overall importance of the grouping factor in the interpretation of the equation. Specifically, it answers the question: Can the same equation be applied to all the groups?

In hypothesis 7a, total profitability was predicted from profit margin and asset turnover rate. For the sample as a whole, the results indicate that both profit margin and ATR were predictors of total profit as measured by return on equity. ROE was fit by the following equation:

ROE = 1.59*MARGIN + 3.64*ART - 2.50.

Both MARGIN and ATR were found to be significant predictors of ROE with slope values significantly greater than 0. For MARGIN the slope of 1.59 is highly significant ($t = 4.30$; $df = 16$; $p < .001$). For ATR the slope of 3.64 is also highly significant ($t = 3.54$; $df = 16$; $p < .01$).

The overall equation has an R-squared = .6028 indicating over 60% of the variance of ROE was explained by MARGIN and ATR. This equation as a whole was also highly significant ($F = 12.14$; $df = 2,16$; $p < .001$).

In the second equation to be considered the equity multiplier replaced ATR in the equation to predict ROE with the result:

ROE = .39*MARGIN - .67*EM + 33.52.

In this analysis the slope for MARGIN was not significantly different from zero, while the slope for EM was significant ($t = -3.41$; $df = 16$; $p < .01$). The overall equation was significant with R-squared = .59 and accounted for 59% of the variance in ROE.

In many respects the results from this analysis are similar to those described above. However, the equation itself is hard to interpret in light of the former analysis. In the first analysis, MARGIN and ATR were both found to be significantly related to ROE. In the second analysis, MARGIN was not found to be related to ROE when the equity multiplier (EM) was in the equation. We take this to mean that MARGIN and EM explain similar components of variance in the ROE variable. This is generally caused by a high correlation between the independent variables, i.e., MARGIN and EM.

Need for Further Research

When the industries were evaluated separately, each analysis had a much smaller sample size than when the sample was examined as a whole. Although the equation for the pooled sample showed a rather strong relation between the predictor variables and ROE, the samples sizes for the individual industries were apparently just too small. None of the equations showed significant relationships. The overall R-squared was not significant and neither of the slopes were significant for any of the industries.

The final type of analysis was

concerned with whether or not a single equation could be applied across all the industries. In the first analysis the concern was with fitting an equation to the sample disregarding industry type. The next analysis under consideration is concerned with the appropriateness of ignoring industry type. This analysis compares the results that are obtained fitting the sample as a whole with the results that are obtained when the coefficients are fitted to each industry separately. Allowing each industry to have its own slopes and intercepts will always create a better fit to the data than if all the industries are forced to use the same coefficients. The question, then, is whether forcing all the industries to use the same coefficients results in a significant loss in predictive power. If the loss of predictive power is significant, this indicates that predictive equations should be created for individual industries.

The results showed a significant improvement in the degree of fit when industries were allowed to have their own coefficients ($F = 5.46$; $df = 6,10$; $p < .01$). Hence, the results suggest that pooling over industries is a questionable practice because the particular coefficients observed depend on which industries were selected. This makes the results rather difficult to interpret because the individual slopes were based on very small sample sizes and were so unstable that they could not be differentiated from zero. This finding indicates that the relationship is not the same from industry to industry and that further research concerned with the exact nature of the relationship between ROE and the predictor variables should be done on larger collections of data points selected from within a single industry.

Summary and Conclusions

The discussion of analytic results was grouped into three clusters. The first cluster was concerned with the changes that occurred in four dependent variables before and after deregulation. These analyses also included comparisons between deregulated and regulated industries. The clearest finding was that profit margins declined when an industry was deregulated. Other elements of the theory, such as changes in asset turnover rates and the equity multiplier were not supported by the results. Results from the second cluster were not interpreted since the correlation are not vital to the line of argument presented by hypotheses one through four. The correlation has simply been left out of the analysis. The third cluster involved two multiple regression equations which predicted ROE from pairs of independent variables (MARGIN and ATR; MARGIN and EM). Although the results for the sample as a whole were informative, the small sample sizes for individual industries hampered interpretation of these results. The results indicated that the independent variables for each of the equations did a fairly good job predicting ROE, but the coefficients for the equation needed to be estimated for each individual industry since they were not consistent across industries.

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