Annual and Quarterly Financial Data: Accuracy of Investment Decision

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Abstract

Accounting data has been given more consideration recently because of its usefulness in investment decisions. Annual and quarterly accounting data are used by investors in forming their future expectations. The results of this study indicate that the quarterly financial data may not be as accurate as the annual data data or in using the data they have.

Introduction

Increasing attention is being given to the annual and quarterly accounting data. This attention is related to both (1) the importance of research on annual and quarterly accounting issues and (2) the requirement by the Securities and Exchange Commission (SEC) of full and fair disclosure of all material facts concerning securities offered to the investing public. Through its reporting requirements, the SEC is trying to help investors in forming their expectations about the future prospects of enterprises. These reporting requirements form the basis of this research. The goal of this study is to look for evidence of the existence of income enhancement and to look at accuracy of the investment decisions. The first basic objective is to determine if the frequency of occurrence of second digits contained in income numbers of North American firms (annual and quarterly data) departs significantly from expectations. The second objective is to determine whether the annual and quarterly data issued provides accurate information.

The remainder of this paper is divided into four sections. The first section identifies the differences between the annual and interim reporting. The second section describes the research design and sample selection. The next section reports the primary results. The final section presents the summary and conclusions.

Annual and Interim Reports

Annual Reports

Created in 1934 by the Securities Exchange Act, the SEC was given the responsibility of ensuring the fair and full disclosure of information submitted to the investing public. The idea that investors should be furnished with a full information set in order to form expectations about the future performance of firms was behind the creation of the SEC. Filed annually by publicly traded firms, the form 10-K is a primary method of satisfying this responsibility. More information is required in the 10-K filing than typically appears in the annual report to shareholders. Thus, the 10-K supports investor requirements for the current information necessary in an active trading market.

Interim Reporting

Most publicly-owned companies are required to file a quarterly report on form 10-Q under the Exchange Act. The SEC, in Accounting Series Release 286, revised requirements for interim financial information in quarterly reports and registration statements to make them consistent with the requirements for annual reporting.

Interim financial information is to include disclosures, either on the face of the financial statements, or in accompanying footnotes, sufficient so as to make the interim reports not misleading. Since 10-Q reports may be reviewed but are not audited, accountants may not become aware of all significant matters.

In general, the rules regarding the inclusion of interim financial information in registration statements parallels requirements for interim financial data under form 10-Q. The rules do not require registrants to provide in registration statements interim financial data anymore current than interim data required for most registrants in quarterly reports on form 10-Q.

Research Design and Sample Selection

In order to determine whether firms enhance the income numbers issued in financial reports, the frequency of occurrence of numbers appearing as the second digit in income numbers of annual and quarterly reports was examined. The following null hypotheses were established.

H1: The occurrence of numbers appearing in the second place of income numbers in annual reports conforms to the expected random distribution.

H2: The occurrence of numbers appearing in the second place of income numbers in quarterly reports conforms to the expected random distribution.

To investigate the issue of whether the annual report provides information more accurate than the quarterly, the following hypothesis was established.

H3: The quarterly financial data have the same average data as the annual financial data.

This study also uses the results of these first two hypothesis tests to support the third hypothesis which investigates the issue of whether the annual report provides information more accurate than the quarterly.

Data and Sample Selection

The data include the first, second, third, and fourth quarter income before extraordinary items announced by 190 firms between January 1985 and December 1987, obtained from the Compustat tapes. In addition, 190 firms were selected for the period January 1982 to December 1987, also obtained from Compustat as annual financial data.

The method involved counting the number of times the natural numbers 1,2,...9 occurred as first digits and 0,1,2,...9 occurred as second digits. For the first digit, if a decimal point or zero occurred before the first natural number, the firm was not included in the sample. All firms having losses were also excluded since rounding of income numbers in negative income years will probably differ from rounding in positive income years.

Descriptive Statistics and Model Analysis

The probability of any digit occurring in a particular location in a number would seem to be one-ninth for the first digit and one-tenth for the later digits. However, this is not the case. Benford [1938] developed a proof shows that the empirical distribution of any integer A appearing as the first digit for numbers taken at random from a large body of physical or observational data is:

$$F_a = \log\left(\frac{a+1}{a}\right)$$

where F_a is the frequency of the digit a in the first place of used numbers. Also Benford extended his model to determine the probability of each integer (F_b) appearing as the second digit of any random number. Benford also concluded that the distribution of digits in all places of multiple digit numbers will be nearly uniform.

$$F_b = \left(\frac{ab+1}{ab}\right) / \left(\log\frac{a+1}{a}\right)$$

Test on Digits

Part One

Chi-square and the Z-statistic were used to assess the degree of correspondence between the observed and expected observation in each category and to ensure that there was no bias in the size of the income numbers. The null hypothesis was tested by using the following Chi-square statistic:

The larger the value of X^2, the less likely it is that the observed frequency came from the population on which the hypothesis and the expected frequencies are based.

$$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

O_i is the observed number of cases in each category

E_i is the expected number of cases in each category

Since we are comparing the data from one sample with some presumed population, the Chi-square goodness-of-fit test is chosen because the hypothesis under test concerns a comparison of observed and expected frequencies.

In testing H1 at the .05 level, the critical level of X^2 for df (8) is 15.51. Since the obtained value of X^2 was 7.606 for the annual report, we cannot reject the hypothesis. Overall, the income figures (annual report) do not deviate widely from the expected distribution. As shown in Table 1, digit one is significant at the .05 level which conforms to the conclusion of Benford (1938) who found that more numbers begin with digit 1 than with the digit 9. The results also show that digit 9 has a negative residual value and Z-score. This finding indicates that less cases were observed than were expected on digit 9. In general, the distribution of digits (annual reports) conforms to expectation for the first place digits.

In Table 2 (annual report) there is evidence that the distribution of the digits do not deviate widely from the expectation especially for digits zero and nine. The evidence indicates that the observed numbers are almost equal to the expected (the Chi-square value is 7.316 which is significant at the .05 level). Thus, the null hypothesis, that the occurrence of numbers appearing in the second place conforms to the expected random distribution, cannot be rejected. There will be almost a normal occurrence at the zero and nine numbers.

The results shown in Tables 1 and 2 provide evidence that the distribution of the first and second digits (annual

TABLE 1
Frequency of First Digits in Income Numbers (n=1837)

Annual Data

Digit	Expected Frequency %	Observed Frequency %	Observed Deviation %	Z-Statistic
0	-	-	-	-
1	30.1	31.90	+ 1.80	+ 1.68*
2	17.6	18.18	+ 0.58	+ 0.66
3	12.5	12.96	+ 0.46	+ 0.59
4	9.7	8.82	- 0.88	- 1.28
5	7.9	7.62	- 0.28	- 0.44
6	6.7	6.59	- 0.11	- 0.19
7	5.8	5.23	- 0.57	- 1.05
8	5.1	4.35	- 0.75	- 1.45
9	4.6	4.35	- 0.25	- 0.50
	100.0		-	
Chi-Square			7.606	
Significance			0.473	

* Significant at the 0.05 level

TABLE 2
Frequency of Second Digits in Income Numbers (n=1837)

Annual Data

Digit	Expected Frequency %	Observed Frequency %	Observed Deviation %	Z-Statistic
0	12.0	12.03	+ 0.03	+ 0.04
1	11.4	12.68	+ 1.28	+ 1.73*
2	10.9	10.78	- 0.12	- 0.17
3	10.4	10.62	+ 0.22	+ 0.30
4	10.0	9.91	- 0.09	- 0.13
5	9.7	8.82	- 0.88	- 1.28
6	9.3	8.27	- 1.03	- 1.46
7	9.0	9.69	+ 0.69	+ 1.03
8	8.8	8.71	- 0.09	- 0.14
9	8.5	8.492	- 0.008	- 0.013
	100.0		-	
Chi-Square			7.316	
Significance			0.604	

* Significant at the 0.05 level

report) do not deviate widely from the expectation. Thus, the null hypothesis cannot be rejected for both digits, suggesting that the annual reports may have accurate accounting data.

In testing H2, the results shown in Table 3 present evidence about the first digit in quarterly data. Since the X^2 value is more that the critical value, the null hypothesis can be rejected at the .05 level. Therefore, the income figures (quarterly report) for the first digits deviate from the expected distribution. Digits three and five have a significant Z-score at the .01 level and digit two at the .05 level. The overall distribution of digits does not conform to expectation. Table 4 (quarterly report) provides evidence that the distribution of digits does deviate widely from the expectation. The evidence indicates that the null hypothesis can be rejected. There will be an abnormally low occurrence of the number zero and an abnormally high occurrence of the number nine. It is clear that there is some bias toward numbers having nine as a second digit. In contrast, there are fewer zeroes than expected. The

TABLE 3
Frequency of First Digits in Income Numbers (n=2279)

Interim Data (Quarterly)

Digit	Expected Frequency %	Observed Frequency %	Observed Deviation %	Z-Statistic
0	-	-	-	-
1	30.1	30.72	+ 0.62	+ 0.64
2	17.6	19.70	+ 2.10	+ 2.63**
3	12.5	14.92	+ 2.42	+ 3.49*
4	9.7	9.30	- 0.40	- 0.64
5	7.9	5.84	- 2.06	- 3.65*
6	6.7	5.00	- 1.70	- 3.24*
7	5.8	5.53	- 0.27	- 0.55
8	5.1	4.96	- 0.14	- 0.31
9	4.6	4.04	- 0.56	- 1.28
	100.0		-	
Chi-Square			41.09	
Significant			0.0005	

*Significant at the .01 level
** Significant at the .05 level

TABLE 4
Frequency of Second Digits in Income Numbers (n=2279)

Interim Data (Quarterly)

Digit	Expected Frequency %	Observed Frequency %	Observed Deviation %	Z-Statistic
0	12.0	11.72	- 0.28	+ 0.42
1	11.4	10.14	- 1.26	- 1.90*
2	10.9	9.96	- 0.94	- 1.44
3	10.4	10.75	+ 0.35	+ 0.55
4	10.0	10.75	+ 0.75	+ 1.193
5	9.7	8.82	- 0.88	- 1.28
6	9.3	8.27	- 1.03	- 1.46
7	9.0	9.69	+ 0.69	+ 1.03
8	8.8	8.71	- 0.09	- 0.14
9	8.5	8.492	- 0.008	- 0.013
	100.0		-	
Chi-Square			7.316	
Significance			0.604	

* Significant at the .05 level

quarterly data show that the distribution of the first and second digits deviates from the expectation. The results indicate that the quarterly data, in general, is not as accurate as the annual data, but there is not a great deviation.

Part Two

There is a long line of research concerning the predictive ability of investors using accounting disclosure data to make investment decisions. This research includes statistical models to classify firms according to various credit ratings and to predict corporate bankruptcy. [Beaver, 1966; and Dietrich and Kaplan, 1982] Another type of research seeks to explain market reactions to earnings announcements.

This part has a different approach, which is to try to investigate the accuracy of the annually and quarterly announcements data, believing that if companies do enhance their announced data, users will be led to make abnormal decisions. This study proposes that the problems behind the inaccurate decisions or misunderstandings of the market are the inaccuracy of announced data, especially the quarterly data which is often used more than annual and is not audited. In order to determine whether this phenomenon exists, this study used the same data used in part one and applied the t-test. To have a valid test this paper compares the sum of the four quarterly financial figures with the annual financial figures. Therefore, the null hypothesis is that the quarterly financial data have the same average data as the annual financial data.

The T-test compares the variance of the two samples to determine whether these variances are significantly different.

The result shows that the F-value (1.93), is not significant (probability = 0.340), and the study can therefore conclude that the two variance are not significantly different. Thus, the conclusion based on the pooled variance estimate is used to draw a conclusion about the means of the two groups. In this case the t-value is (4.07) and the conclusion would be based on it.

TABLE 5
Independent Sample T-Test

						Pooled Variance Estimates	
Variable	Std Mean	Def	F Value	2-tail Prop	T-Value	2-Tail Prop
Annual	183.7	27.88				
			1.93	0.340	4.07	0.001
Quarterly	227.9	20.05				

The probability of t-value is (0.001) which means that the null hypothesis that the variances are equal is rejected. In other words, the study conclude that the means of the two groups are not equal.

The large observed significance level found indicates that the results would not be far out if the two means are equal in the population. In other words, the results show that (.340) of the time a difference of (4.07) would occur when the two population means are equal.

The results in this part indicate that the null hypothesis can be rejected, which means that the quarterly data may not be accurate as the annual data.

The results shown in part one also support the results in this part which indicate that the quarterly data does not conform to the random distribution and that the firms may have rounded their financial data.

This part indicates that the quarterly financial data issued may not be as accurate as the annual financial data issued. These results could be true since the data are not audited and it published only for market use. The results do not support the SEC's intention of making the interim financial information in quarterly reports consistent with the requirements of annual reporting.

Assuming that the data issued in both annual and quarterly reports are almost accurate, what are the reasons behind the inaccurate decisions? The problem may lie with the investors themselves. In other words, their estimations or expectations of the information may be different from the actual because of faulty analysis. The data itself may be accurate. The second reason is the inability of the investors to gain access to enough data, which could be controlled by the companies in some cases. Bamber [1987] found that the greater the unexpected quarterly earnings, the greater the magnitude and duration of the abnormal trading volume reaction. Also some investors are able to get some insider information more than another which is illegal and it considers as kind of stock manipulation. Therefore, the investors can be misled or make abnormal decisions. Finally, the investors may be used different kind of data other than the annual and quarterly in making their investment decisions.

Summary and Conclusions

This study used 190 U.S. firms for annual data and the same for quarterly data to identify the distribution of income numbers appearing in financial statements. The accuracy of the financial data issued annually and quarterly was also studied. The results showed that there is a small deviation from the random distribution. The results also indicate that the financial data issued by quarterly reports may not be accurate as the annual reports, and the quarterly reports were not consistent with the annual reports. The study also considered the problems behind abnormal decisions and the mixed dilemma in the market.

The explanation may lie in the abnormal or unreasonable expectations of investors and insufficient data before the announcement date. Also some investors are able to get some insider information more than another which is illegal and it considers as kind of stock manipulation. Therefore, the investors can be misled or make abnormal decisions. Finally, the investors may be used different kind of data other than the annual and quarterly in making their investment decisions.

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