

Ratio Analysis – Predictor of Fraud?

Liming Guan
PhD Candidate
Oklahoma State University

Kathleen A. Kaminski
Assistant Professor
Georgia College and State University

T. Sterling Wetzel
Associate Professor
Oklahoma State University

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ABSTRACT: Fraud in business is a matter of grave social and economic concern. The Treadway Commission recommended that the Auditing Standards Board require the use of analytical review procedures to improve the detection of fraudulent financial reporting. This research is an exploratory study to determine if the financial statements of fraudulent companies differ from those of non-fraudulent companies. Fraudulent firms were identified by examining the SEC's Accounting and Auditing Enforcement Releases issued between 1982 and 1995. The fraudulent firms ($n = 79$) were then matched with non-fraudulent firms on the basis of firm size and industry. Using this matched-pairs design, ratio analysis for a seven-year period (i.e., the fraud year $-/+ 3$ years) was conducted on 21 variables. Overall, 16 ratios were found to be significant. Of these, only three ratios were significant for three time periods. Of the 16 statistically significant ratios, only five were significant during the period prior to the fraud year. Using discriminant analysis, misclassifications for fraud firms ranged from 41% to 76%. These results provide empirical evidence that financial ratios are not an effective means to detect the occurrence of fraud.

Key Words: *auditing, analytical review procedures, fraud, ratio analysis*

Data Availability: *Data available from public sources; for more information, please contact the second author.*

MOTIVATIONS FOR STUDY

Fraud in business is a matter of grave social and economic concern. “The U. S. Chamber of Commerce estimates that the annual cost of fraud exceeds \$100 billion” (Glover and Aono 1995, 3). Fraudulent financial reporting is a critical problem for external auditors, both because of the potential legal liability for failure to detect false financial statements and because of the damage to professional reputation that results from public dissatisfaction about undetected fraud. Current professional standards maintaining that the auditor is not responsible for detecting management fraud because of the inherent limitations of the audit process do not serve to prevent litigation against the auditor or significant payments by the auditor in cases of management fraud. The Private Securities Litigation Reform Act of 1995 was partly motivated by the expanding litigation risk faced by auditing practitioners. One provision of the Reform Act requires that audits include procedures designed to provide reasonable assurance of detecting illegal acts that would have a direct material effect on financial statements (King and Schwartz 1997).

Increasing pressure to reduce fraudulent financial reporting over the past 30 years has resulted in new laws, commission reports, and standards. Public concern for fraud detection began during the early 1970s with the famous Equity Funding case. Such concern eventually led to the Senate’s Metcalf Commission and the AICPA’s Cohen Commission. Various recommendations made by these commissions were eventually adopted by the FASB and the ASB. During the mid-1980s, the savings and loan debacle created a new wave of public concern. Congressional inquiry led to the formation of the

Treadway Commission whose charge was to prescribe effective recommendations to guide the ASB's development of standards to help prevent and detect fraud.

In 1988, the ASB issued nine new "expectation gap" standards designed to (1) outline clearly the external auditor's role concerning fraud, (2) enhance overall audit procedures for detecting and preventing fraud, and (3) enhance communications between the auditor and management, the audit committee and the public (Glover and Aono 1995). "SAS No. 53 was designed to narrow the gap between clients' expectations regarding the auditor's responsibility to detect fraud during an audit and what that responsibility actually is" (Levy 1989, 52). In 1996, the U. S. General Accounting Office's (GAO) report *The Accounting Profession, Major Issues: Progress and Concerns*, identified responsibilities for fraud as a major unresolved issue. "The GAO believes an expectation gap still exists for auditor responsibilities and performance related to detection of fraud" (Carmichael 1997, 20). In 1996, the ASB issued SAS No. 82 *Consideration of Fraud in a Financial Statement Audit* in hopes of closing the seemingly ever-present expectation gap. The standard ". . . provides expanded operational guidance on the auditor's consideration of material fraud in conducting a financial statement audit" (Mancino 1997, 32). It clarifies but does not expand the auditor's responsibility to detect fraud.

Users want auditors to assume more responsibility for the detection of fraud. A "clean" audit opinion is neither a warranty nor certification that fraud has not occurred. Detection of fraud is not a primary objective of a financial statement audit. Auditors are not particularly well trained to uncover sophisticated fraud (Johnston 1995, 47). Auditors do not detect fraud for a number of reasons. Some frauds are well beyond the scope of the

audit. Some are too well concealed; others are too small. Perhaps the greatest reason is that the evidence is not reflected in the financial statements. Off-book frauds tend to involve upper levels of management, involve much larger amounts, and are not normally detected by traditional audit procedures (Wells 1990, 86).

Although the number of fraudulent financial statements is small in relation to the number of audits performed, cost-effective methods are needed to improve their detection and deterrence. The combination of downward pressure on audit fees and demands that auditors take more responsibility for detecting misstatements in their clients' financial information has led auditors to seek audit procedures that are both efficient and effective. CPAs have increased their use of analytical procedures in an effort to improve audit efficiency and effectiveness. "The Treadway Commission recommended that the ASB require the use of analytical procedures on all audits to improve the detection of fraudulent financial reporting" (Wheeler and Pany 1996, 558). The question remains unresolved as to whether errors and/or irregularities are detected effectively through these procedures (Blocher 1992).

Practical evidence is needed to better understand the error detection capabilities and cost savings potential of ARPs. "Analysis of ratios of account balances is a widely applied attention-direction procedure, yet little is known of the ability of ratio analysis to identify material monetary error in actual accounting data" (Kinney 1987, 60). Failing to predict fraud when it occurs (i.e., a Type II error) is much more costly to CPA firms than predicting fraud when it does not occur (i.e., a Type I error). Type I errors result in inefficient audits while Type II errors result in potential litigation (Hansen et al. 1996).

In a discussion of Kinney's (1979) study, Baruch Lev posited that “. . . perhaps some information can be obtained from proven cases of errors or irregularities, such as bankruptcies and fraud” (Lev 1979, 167). This comment was made over twenty years ago, yet only a small number of studies have used such an approach. Most recently, the Committee of Sponsoring Organizations of the Treadway Commission sponsored a descriptive research study by Beasley et al. (1999) that provides a comprehensive analysis of fraudulent financial reporting occurrences investigated by the SEC subsequent to the issuance of the 1987 Treadway Commission report.

The Fall 1997 *The Auditor's Report* of the AAA encourages auditing practitioners and faculty to engage in research directed toward assisting auditors in preventing and detecting fraud. It suggests examining data on prior fraud litigations to find “lessons” for auditors to follow. It posits the following question – “Can analytical procedures be better used to detect fraud warning signals? SAS No. 82 has little guidance on the role of analytical procedures in fraud detection. Research in this area would have been helpful to the ASB Task Force in going beyond generic guidelines to offer more specific direction to auditors in this area” (Landsittel and Bedard 1997, 4).

PRIOR RESEARCH

Auditors must research approaches that will enable them to place a greater emphasis on identifying indications of potential fraud. Analytical review procedures (ARPs) is the name used for a variety of techniques the auditor can use to assess the risk of undetected error in financial records. These procedures involve the analysis of trends, ratios, and reasonableness tests derived from an entity's financial and operating data.

Such financial analysis is frequently posited to be a useful tool for identifying irregularities and/or fraud (Thornhill 1995). While the procedures are well known and widely used, there is a general lack of understanding of how they are properly applied and how much reliance should be placed on them.

An outline is presented in Table 1 of the major empirical studies looking at the detection of errors and/or irregularities in financial statements that were conducted during the period 1979 – 1999.

(Insert Table 1 here)

Summarized conclusions include the following:

- Percent of errors identified by ARPs ranged from 15 percent to 50 percent (Blocher and Cooper 1988; Calderon and Green 1994; Hylas and Ashton 1982; Kreutzfeldt and Wallace 1986; Wright and Ashton 1989).
- Some studies found ARPs not effective when done at an aggregate level (Blocher 1992; Kinney 1987) while others found ARPs not effective when applied to quarterly data (Wheeler and Pany 1996).
- Wide range of ARPs is generally applied extensively and include both financial and operating data (Blocher 1992; Blocher and Cooper 1988; Daroca and Holder 1985; Holder 1983).
- Predominant use of simple, quantitative ARPs (Daroca and Holder 1985; Kinney 1979; Tabor and Willis 1985; Wright and Ashton 1989).
- Substantive tests are most effective at revealing irregularities (Loebbecke et al. 1989).

- Prior period adjustments are a reasonable indicator of current year's error (Kinney 1979) and from 33 percent to 50 percent of errors are caused by client personnel inexperience (Hylas and Ashton 1982; Kreutzfeldt and Wallace 1986).
- Only a few studies looked exclusively at detecting fraud (Bernardi 1994; Blocher 1992; Calderon and Green 1994; Lee et al. 1999; Loebbecke et al. 1989; Persons 1995).

Much of this research addressed the effectiveness of analytical procedures. Three general approaches have been followed: “. . . (1) ex post analyses of errors discovered in actual audits, (2) application of analytical procedures to simulated accounting data seeded with errors, and (3) application of analytical procedures to actual accounting data seeded with errors” (Wheeler and Pany 1996, 559). As the previous summary indicates, the conclusions reached by these approaches have been quite disparate.

Despite the past efforts of researchers, there is a need for more detailed investigation of the precise capacities of audit practice in detecting fraud (Humphrey et al. 1993). Better fraud detection depends on improved audit procedures that may result, in part, from expanded research on “red flag” conditions that indicate the potential for fraud (Elliott and Jacobson 1986).

This study was a direct response to the above multiple concerns and its approach was quite different from that of prior studies. The authors believed it was time to step back and asked a seemingly very basic question. Do the financial statements of fraudulent companies differ from those of nonfraudulent companies? If so, would ARPs identify such differences? Do ratio analysis results differ for fraudulent versus nonfraudulent

firms? Do differences exist prior to the fraud, subsequent to the fraud, both? This study was very exploratory in nature. It compared actual financial statement data of fraudulent firms to comparable nonfraudulent firms to determine if any relationship(s) exist. It covered multiple time periods including both fraud and nonfraud years. The findings of the study provide the needed empirical evidence to evaluate the widely held contention that ARPs are a useful tool for identifying irregularities and/or fraud.

SAMPLE SELECTION AND RESEARCH DESIGN

Firms involved in fraudulent financial reporting were obtained from the SEC's Accounting and Auditing Enforcement Releases (AAERs) issued between 1982 and 1995. A firm reported in an AAER was included as a potential sample fraud firm if the SEC accused top management of reporting materially false and misleading financial statements. More specifically, the SEC alleged violation of Rule 10(b)-5 of the 1934 Securities Exchange Act. Rule 10(b)-5 requires the intent to deceive, manipulate or defraud. Upon finding sufficient evidence of fraud, the court entered final judgment of permanent injunction.

For the purposes of this study, the "fraud year" was defined as the first year for which the financial statement(s) included fraudulent data. In most instances, the actual discovery of the fraud occurred several years subsequent to the fraud year. A fraud firm was included in the sample if the appropriate financial statement data were available for the fraud year. Such financial statement data were collected from SEC 10K and/or annual report files. See Table 2 for a reconciliation of AAERs and the identification of fraud firms.

(Insert Table 2 here)

Using COMPUSTAT, each fraud firm was matched with a nonfraudulent firm based on the following requirements:

1. stock exchange – common stocks traded on the same national stock exchange (NASDAQ, AMEX, NYSE);
2. firm size – considered similar if total assets is within ± 30 percent of the total assets for the fraud firm in the year preceding the fraud year; if no match found, considered similar if total sales is within ± 30 percent of the total sales for the fraud firm in the year preceding the fraud year;
3. industry – firms identified in 1 and 2 above were reviewed to identify a nonfraud firm within the same four-digit SIC as the fraud firm; the nonfraud firm selected was the one with the closest total assets or total sales to the fraud firm; if no match was found using the four-digit SIC, then the three-digit and finally two-digit codes were matched.

For each firm included in the sample, financial statement data for the three year period both preceding and subsequent to the fraud year were obtained (i.e., fraud year ± 3 years). Given a total time span of seven years, there were many instances where complete data was not available. Accordingly, the sample size varied for both fraud firms and nonfraud firms for each time period.

One limitation of the above sample selection process involves the potential misclassification of a nonfraud firm. Financial statement fraud might have occurred but had yet been undetected.

The variables used in this study were ratios computed from the sample firms' income statements and balance sheets. Ideally, the selection of financial ratios used for analysis should be based on theory and coupled with demonstrated empirical evidence of their usefulness. An acceptable theoretical foundation for the selection of ratios for decision making does not currently exist. Prior studies have produced scattered heterogeneous empirical evidence regarding ratio usefulness. To date, a complete set of useful ratios has not been identified. Given these considerations and the exploratory nature of this study, a fairly comprehensive set of financial ratios was chosen for inclusion. See Table 3 for a complete listing of ratios.

(Insert Table 3 here)

The methodology of this study was similar to the one used by Persons (1995). That study compared fraud versus nonfraud firms for a two-year period – the fraud year and the preceding year. Ten variables were used including eight ratios. Size was used as a variable rather than a sample-matching criterion. This study was much more comprehensive, looking at many more ratios over an extended period of time.

RESULTS

Both univariate and multivariate analyses were conducted. Given the matched-pairs design, paired-sample t tests were conducted for each variable (i.e., ratio) to determine if the mean of the fraud sample was significantly different than the mean of the nonfraud sample. Results of the t tests are reported in Table 4.

(Insert Table 4 here)

Of the 21 ratios analyzed for a seven-year time period, 16 were found to be statistically significant at an α level of .10 or less. Of these, eight were significant for only one time period and four were significant for two time periods. Only three ratios were significant for three time periods (i.e., FA/TA, TL/TA, WC/TA). Of the 16 statistically significant ratios, only five were significant during the period prior to the fraud year (i.e., AR/TA, COGS/SAL, FA/TA, IE/TL, SAL/AR). Four ratios were consistently significant during the period subsequent to the fraud year (i.e., NI/TA, RE/TA, TL/TA, WC/TA). These results provide empirical evidence of the limited ability of financial ratios to predict the occurrence of fraud.

Given the large number of independent variables (i.e., 21 ratios), multivariate analysis was warranted. Discriminant analysis is the appropriate statistical technique for testing the hypothesis that the group means of a set of independent variables for two groups (i.e., fraud vs nonfraud) are equal. For each of the seven years tested, the chi-square value to test the homogeneity of within covariance matrices was found to be significant. Accordingly, the within covariance matrices were used in calculating a quadratic discriminant function. Results are reported in Table 5.

(Insert Table 5 here)

The resubstitution method used the same data both to define and to evaluate the classification criterion. As shown in Panel A, the ratios are quite effective in classifying nonfraud firms, having a minimum hit ratio of 98% and misclassifying a firm as fraudulent less than 2% of the time. Meanwhile, the hit ratio for fraud firms is between a low of 24% and a high of 59%. Misclassifications range from 41% to 76%.

To reduce the optimistic bias resulting from the resubstitution method, two options were available. The first option was to split the sample into two sets, using one part to derive the discriminant function and the other set to test the classification criterion. Alternately, the cross-validation procedure (Lachenbruch and Mickey 1968) can be used whereby one observation is left out when determining the discriminant function and then used for classification purposes. This procedure is then repeated for each of the observations. The final result is a nearly unbiased estimate.

Given the limited number of fraud firms available, the split sample option was not feasible. Accordingly, the cross-validation method was used and the results are presented in Panel B. As expected, the hit ratios declined for both the fraud firms and the nonfraud firms. The tested financial ratios were still effective at identifying the nonfraud firms, having a misclassification ratio of between 10% and 16%. Meanwhile, the fraud firms were misclassified as nonfraudulent between 58% and 98% of the time. These results provide empirical evidence that financial ratios are not an effective means to detect the occurrence of fraud.

CONCLUSION

ARPs are used to assess the risk of undetected errors in financial records. There is a widely held contention that financial ratio analysis can be a useful tool for identifying irregularities and/or fraud. The Treadway Commission even recommended that the ASB require the use of ARPs on all audits as a means to detect fraudulent financial reporting (Wheeler and Pany 1996). SAS No. 82 provided only generic guidelines on the role of ARPs in fraud detection. Despite the prevalent use of ratio analysis, empirical support on

the ability of such analysis to detect fraud has been lacking. Research either supporting or disclaiming the effectiveness of ARPs for detecting fraud is warranted. This study undertook such a challenge. It compared a multitude of financial ratios for fraudulent and nonfraudulent firms for an extended time period both pre- and post-fraud. Statistically there was not much difference in the ratios of fraud versus nonfraud firms. These findings refute the popular contention that ratio analysis is an effective means to detect fraud. This study only partially addressed the question posed by the AAA – “Can analytical procedures be better used to detect fraud warning signals?” (Landsittel and Bedard 1997, 4). Additional research regarding effective means of fraud detection is urgently needed for the prescription of appropriate standards.

TABLE 1
RESEARCH ON ERROR / IRREGULARITY DETECTION

	Scope of Study	Objectives of Study
Bernardi (1994)	152 managers, 342 seniors	examines influence of client integrity and competence, auditor's prior belief of existence of fraud, auditor cognitive style on fraud detection
Blocher (1992)	21 internal auditors, external auditors and controllers from 17 different firms	examines extent ARPs are used by each group to detect management fraud, how effective ARPs are in detecting fraud, differences in usage of trend analysis, ratio analysis, and modeling among groups, experience, cognitive skills, differences in decision processes among groups
Blocher and Cooper (1988)	5 experienced auditors perform ARP on 14 realistic inventory cases	examines how ARP used and if effective in detecting materially seeded errors; uses verbal protocol analysis
Calderon and Green (1994)	114 actual fraud cases published in The Internal Auditor, 1986-1990	examines internal control, personnel most likely to commit fraud, personal actions, initial signal of fraud, transaction cycle, business types
Coglitore and Berryman (1988)	review of SEC Releases and legal cases with large financial misstatements; use of operating and quarterly data	identifies cases where ARPs would have revealed unusual relationships or changes in relationships and lead to detection of material misstatement
Daroca and Holder (1985)	questionnaires sent to 1600 members of Private Companies Practice section of AICPA; 269 usable responses	examines applicability and usage of different type of ARPs in audits and reviews
Holder (1983)	35 seniors from national, regional, local CPA firms	examines ARPs selected during audit planning; case study
Hylas and Ashton (1982)	281 errors requiring adjustment on 152 audits	examines initial event signaling error, cause of error, industry type, entity size

	Scope of Study	Objectives of Study
Kinney (1987)	48 months of actual firm data seeded with material errors; purchase not recorded or fictitious sale recorded	examines 3 investigation rules: simple percentage change, statistical standardized change, pattern analysis of cross-sectional changes
Kinney (1979)	3 years of data from 44 small manufacturing firms	examines prior period adjustments as indicator of current year's errors
Kreutzfeldt and Wallace (1986)	1,506 errors for 260 engagements	examines number and magnitude of error, types, causes, methods of detection, associations with industry, company size, SEC status and relationship to environmental factors
Lee et al. (1999)	56 fraud firms, three years prior to fraud year through one year following fraud year	examines earnings and cash flow relation as a possible signal for fraud
Loebbecke et al. (1989)	survey of 121 KPMG audit partners who had experienced a material irregularity	examines detailed information about one material irregularity selected by participant; determines presence of indicators per SAS 53 and Loebbecke-Willingham assessment model before discovery of irregularity
Loebbecke and Steinbart (1987)	38 publicly traded firms from various industries; 22 additional firms as hold-out sample for validation; 1980-1984	examines accuracy of preliminary ARP in detecting errors using error-free vs error-seeded data; applied four different investigation rules
Persons (1995)	103 fraud firms, fraud-year period 1970-1990 matched with nonfraud firm on basis of industry and time period	examines variables for estimating models of fraudulent financial reporting, model estimation method, and assessment of models' predictive ability
Pincus (1989)	137 auditors at mid-level of large CPA firm	examines efficacy of a red flags questionnaire for assessing risk of material fraud
Tabor and Willis (1985)	7 audit managers from Big Eight firm each selecting 2 clients and their 1978, 1982 audit work papers	examines current role of ARPs in audit process, whether the process changed over the 1978-1982 period, outlook for the future

Scope of Study

Objectives of Study

Wheeler and Pany
(1996)

5 sample companies using actual data seeded with material simulated accounting errors

examines effects of 8 common errors on 15 ARPs (8 ratios, 7 accounts); examines 6 models and five investigation rules

Wright and Ashton
(1989)

186 engagements involving 368 proposed adjustments of a Big-Eight firm

examines types of errors, income effects, causes of errors, initial events identifying adjustments, internal control strength, ordering bias

TABLE 2
Identification of Fraud Firms

Accounting and Auditing Enforcement Releases (AAERs) #1 – 712 for the period 4/82 - 9/95	712
Less:	
• AAERs not referencing violation of Rule 10(b)-5	(423)
• AAERs affecting banks/insurance firms, CPA firms, 10Qs, registration statements, or fraud year(s) not identified	(161)
• AAERs expanding other AAERs (e.g., duplicate AAERs for same firm)	(82)
Total number of fraud firms included in study	79

TABLE 3
Ratios

V1	AR/TA	Accounts Receivable / Total Assets
V2	INVTO	Cost of Goods Sold / Inventory
V3	COGS/SAL	Cost of Goods Sold / Sales
V4	CURRAT	Current Assets / Current Liabilities
V5	CA/TA	Current Assets / Total Assets
V6	DE	Total Liabilities / Total Equity
V7	FA/TA	Fixed Assets / Total Assets
V8	GP%	Gross Profit / Sales
V9	IE/TL	Interest Expense / Total Liabilities
V10	INC/CA	Inventory / Current Assets
V11	INV/SAL	Inventory / Sales
V12	INV/TA	Inventory / Total Assets
V13	NI/SAL	Net Income / Sales
V14	NI/TA	Net Income / Total Assets
V15	OPX/SAL	Operating Expenses / Sales
V16	OPI/SAL	Operating Income / Sales
V17	RE/TA	Retained Earnings / Total Assets
V18	SAL/AR	Sales / Accounts Receivable
V19	SAL/TA	Sales / Total Assets
V20	TL/TA	Total Liabilities / Total Assets
V21	WC/TA	Working Capital / Total Assets

TABLE 4
Paired *t*-Tests – Fraud vs Nonfraud
P values

		YEAR-3	YEAR-2	YEAR-1	FRAUDYR	YEAR+1	YEAR+2	YEAR+3
V1	AR/TA	0.2904	0.0881***	0.9739	0.7249	0.8670	0.2056	0.0344**
V2	INVTO	0.2342	0.3113	0.5810	0.8021	0.3496	0.2701	0.3653
V3	COGS/SAL	0.0983***	0.2368	0.2113	0.4943	0.1439	0.0213**	0.6629
V4	CURRAT	0.4961	0.4735	0.6169	0.6884	0.1231	0.0212**	0.1588
V5	CA/TA	0.6317	0.1337	0.4217	0.3388	0.0695***	0.1609	0.5952
V6	DE	0.2943	0.3591	0.6459	0.2918	0.2175	0.3774	0.5039
V7	FA/TA	0.1259	0.0412**	0.0031*	0.0001*	0.6325	0.1269	0.1447
V8	GP%	0.8298	0.7448	0.9749	0.4817	0.8879	0.2466	0.7944
V9	IE/TL	0.0652*	0.3972	0.3792	0.1686	0.3048	0.3224	0.3290
V10	INV/CA	0.2005	0.6256	0.1576	0.0679**	0.6942	0.5778	0.3324
V11	INV/SAL	0.2684	0.3264	0.3196	0.0830**	0.3657	0.6976	0.2902
V12	INV/TA	0.4030	0.9129	0.3435	0.4003	0.4840	0.6094	0.6761
V13	NI/SAL	0.3526	0.9879	0.4329	0.3948	0.2497	0.1071	0.3554
V14	NI/TA	0.2743	0.3166	0.2175	0.2950	0.2503	0.0004*	0.0107**
V15	OPX/SAL	0.3571	0.8800	0.5829	0.3091	0.3328	0.0080*	0.1066
V16	OPI/SAL	0.3604	0.8115	0.2749	0.6963	0.7864	0.0041*	0.2819
V17	RE/TA	0.5029	0.3157	0.5077	0.7753	0.1956	0.0086*	0.0005*
V18	SAL/AR	0.1471	0.2444	0.0568***	0.1050	0.7957	0.5723	0.2198
V19	SAL/TA	0.2088	0.7166	0.1696	0.0463**	0.1821	0.5684	0.3363
V20	TL/TA	0.3080	0.2837	0.7156	0.4319	0.0845***	0.0134**	0.0003*
V21	WC/TA	0.1994	0.5010	0.7074	0.6771	0.0254**	0.0022*	0.0061*

* Significant at $\alpha = .01$

** Significant at $\alpha = .05$

*** Significant at $\alpha = .10$

**TABLE 5
DISCRIMINANT ANALYSIS**

Panel A: Resubstitution Method

	F	N
Year -3		
F	36.59%	63.41%
N	0.00%	100.00%
Year -2		
F	23.64%	76.36%
N	1.54%	98.46%
Year -1		
F	25.37%	74.63%
N	1.43%	98.57%
Fraud Year		
F	27.54%	72.46%
N	1.41%	98.59%
Year + 1		
F	34.55%	65.45%
N	0.00%	100.00%
Year +2		
F	51.16%	48.84%
N	0.00%	100.00%
Year + 3		
F	58.82%	41.18%
N	1.43%	98.57%

Panel B: Cross-Validation Method

	F	N
Year - 3		
F	7.32%	92.68%
N	15.79%	84.21%
Year -2		
F	1.82%	98.18%
N	13.85%	86.15%
Year -1		
F	19.40%	80.60%
N	14.29%	85.71%
Fraud Year		
F	21.74%	78.26%
N	14.08%	85.92%
Year + 1		
F	21.82%	78.18%
N	11.27%	88.73%
Year +2		
F	41.86%	58.14%
N	10.00%	90.00%
Year +3		
F	17.65%	82.35%
N	12.86%	87.14%

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