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AN EMPIRICAL ANALYSIS OF THE LIKELIHOOD OF DETECTING FRAUD IN NEW ZEALAND

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AN EMPIRICAL ANALYSIS OF THE LIKELIHOOD OF DETECTING FRAUD IN NEW ZEALAND

Abstract

The objective of this paper is to provide information on the perceived effectiveness in fraud-detecting of 56 standard audit procedures normally used in stock and warehousing cycle, and to examine auditor-specific factors that influence the likelihood of detecting fraud in the audit of the stock and warehousing cycle in New Zealand. We gathered data through a mail survey of New Zealand auditors in order to ascertain their opinion on the effectiveness of these audit procedures. The results suggest that relatively few (less than half) of the 56 standard audit procedures are perceived by our surveyed auditors as being "more effective" in detecting fraud in stock and warehousing cycle. Further, more than half of the 56 audit procedures are perceived by respondents as having "less effectiveness" in detecting fraud. We employed logit regression analysis to test a model to predict the likelihood of detecting fraud in stock and warehousing cycle, given certain auditor-specific factors. The regression analysis suggests that size of audit firm (measured by the number of employees), auditor's position tenure, and auditor's years of experience are statistically significant predictors of the likelihood of detecting fraud in stock and warehousing cycle in New Zealand. Thus, the likelihood of fraud detection in stock and warehousing increases as the auditor acquires more years of auditing experience, and as the audit firm employs more number of staff.

Note: comment on: Difference from US study; geographic differences in NZ; difference Big 5/non Big 5

Key Words: Fraud detection, Stock and warehousing cycle, Audit procedures, New Zealand.

JEL Classification: M400, M490

1. Introduction and Literature Overview

Corporate fraud is on the increase worldwide. The United Kingdom's (UK's) Audit Commission, for example, reports that the number of frauds has increased by 38 percent since 1990 (Tyler, 1997). Fraud is not only on the increase; it is also expensive. The amount of money involved in 2,608 reported fraud cases over the last ten years, studied by the United States' (US's) Association of Certified Fraud Examiners (ACFE), totalled US$15 billion (Mitchell, 1997).

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In New Zealand, a study of fraud detection in the stock and warehousing cycle is topical. The recent collapse of Fortex Group Limited was partly due to a fraud perpetuated in the stock and warehousing cycle. The management of Fortex classified, and recorded low-value lamb ribs as high-value French lamb legs as part of its year-end stock (Macfie, 1996). The external auditors of this company are believed not to have detected this fraudulent financial reporting (although legal action against the auditors on this issue was eventually settled out of court). Losses to creditors of the company following Fortex's collapse totalled about NZ$70 million (MacLennan, 1996). A study assessing the perceived effectiveness of the audit procedures normally used in stock and warehousing cycle will help auditors to detect further occurrences of similar incidents in New Zealand. Thus, a study such as this will be useful to practitioners in their audit engagements.

New Zealand auditing standards require that auditors have a legal and professional duty to exercise reasonable skill and care in the planning and conduct of the audit so as to have a reasonable expectation of detecting material misstatements arising from fraud or error. When there are indications that fraud (or error) may exist, auditors are required consider the potential effect, and if the effect is material, to perform modified or additional procedures. The standards do not set out how to modify or extend procedures.

Recent studies researching into the likelihood of detecting fraud have examined the use of audit procedures to detect fraud in a typical audit engagement (see, for example, Moyes and Baker, 1995; Moyes, 1996; Moyes and Hasan, 1996; Moyes and Lavine, 1997). These studies find that auditing experience of the auditor and prior success of the auditing organization in detecting fraud are significant in detecting fraud. In the inventory cycle, the size of the auditing organization is associated with greater likelihood of fraud detection (Moyes and Hasan, 1996). Techniques that directly collect evidence are seen to be more effective by auditors than those that indirectly collect evidence and test inventory valuation (Moyes, 1996).

While the efficacy of the use of audit procedures to detect fraud has been tested, it is limited, in most cases, to auditors in the US. This study, therefore, extends this research issue to New Zealand. Specifically, the purpose of the study is three-fold: (1) To assess the degree of fraud-detecting effectiveness of 56 standard audit procedures that are applicable to stock and warehousing cycle[1]; (2) To identify any perceptual differences of auditors in New Zealand on the effectiveness of each of the standard fraud-detecting audit procedures on the basis of: (i) regional location (Auckland, Wellington, Christchurch, and "others"), and (ii) type of audit firm (Big-5 and non-Big-5); and (3) To investigate the relative influence of four audit-specific factors: (i) size of audit firm; (ii) position tenure of auditor; (iii) years of experience of auditor; and (iv) practice review experience of auditor's firm on the likelihood of detecting fraud in stock and warehousing cycle. Based on *a priori* reasoning and prior literature, we expect the four factors to have positive effects on the likelihood of detecting fraud in stock and warehousing cycle.

The emphasis on stock and warehousing cycle is of significance. First, stocks constitute a significant portion of corporate assets, both in absolute size and in proportion to all other assets on the balance sheet. Second, stocks, most often, are held in different locations that make

[1] Although functional activities of companies are inter-twined, auditors often view them as highly integrated sets of five cycles known as *transaction cycles*. The auditing literature provides typical examples of the five transaction cycles: (i) acquisition and payment cycle; (ii) stock and warehousing cycle; (iii) sales and collection cycle; (iv)

physical control and counting difficult. Third, valuation of stocks is difficult due to such factors as obsolescence, and the need to allocate manufacturing costs to stocks. Fourth, there are several acceptable stock valuation methods. These factors make stocks more susceptible to fraud, and hence require a careful audit.

According to Arens and Loebbecke (2000), the stock and warehousing cycle comprises of two separate, but closely related systems. The first is the actual physical flow of goods, and the second is the related costs. They identify five parts of stock and warehousing cycle that must be audited: (i) acquisition and recording of raw materials, labour and overheads; (ii) internal transfer of assets and related costs; (iii) shipping of goods and recording revenues and costs; (iv) physically observing stock; and (v) pricing and compiling stock. Because fraud can occur in any of these parts of the stock and warehousing cycle, each part needs to be audited. This paper incorporates fraud–detecting techniques applicable to all five parts of the cycle.

The layout of the reminder of the paper is as follows. Section 2 presents the background and motivation for the study. Section 3 describes the research design and methodology employed, while Section 4 reports the results of the statistical analyses. Section 5 concludes the paper with highlights on the limitations of the underlying research, and suggestions for future research.

2. Research Design and Methodology

2.1 Sample design and sampling method

Public accountants practising in New Zealand (auditors) serve as our target population. The target population is stratified on a regional basis (i.e., Auckland, Wellington, Christchurch and "others"). It is expected that the extent of fraud occurring in different geographical areas in

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payroll and personnel cycle; and (v) capital acquisition cycle. This study focuses exclusively on the detection of

New Zealand may vary, and therefore the available audit procedures will vary in their fraud-detecting effectiveness. In particular, because Auckland is a cosmopolitan city, we expect the possibility of fraud occurring to be relatively greater in Auckland (i.e., "the big city effect") than in the other regions examined. Sampling units were drawn from each regional stratum. This sampling method is preferred because it minimises the variability of population units within each regional stratum, while maximising the variability across strata.

2.2 Survey development and administration

We collected the data for the study through a questionnaire survey. The survey instrument, which consisted of a cover letter, a pre-paid envelope and a questionnaire, was first mailed to 400 auditors[2] selected on a stratified basis. Of these, 26 were returned to us by the postal agency as undeliverable. One hundred and ten auditors responded with usable questionnaire; representing about 29 percent response rate. Anonymity was promised to all respondents to the survey, which was conducted in late 1999. The questionnaire consists of three parts. The first part collects demographic information about respondents. The second part solicits their opinion on the degree of effectiveness of the 56 standard fraud-detecting audit procedures applicable to stock and warehousing cycle. The respondents were asked to indicate their opinion on the degree of effectiveness of each of the 56 standard fraud-detecting audit procedures on a five-point Likert-like response scale, which ranges from "not effective" (scored as one) to "extremely effective" (scored as five). This measurement procedure was employed for two reasons. First, it is relatively easy for respondents to use, and responses from such a scale are likely to be reliable (Anderson et al., 1983).[3] Second, the quasi interval features of the Likert

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fraud in the functional activity of stock and warehousing cycle.

[2] The survey instrument was revised following a pilot testing on 100 auditors. Of the 33 auditors who responded to the pilot, 26 responses were usable. The revised survey instrument was mailed to our stratified sample. A copy of the survey instrument is available, on request, from the first author.

[3] A concern in mailed survey research is that of non-response bias. To assess the potential effect of non-response bias, a procedure recommended by Oppenheim (1992) was used. Thus, the respondents were divided into two

scale render it appropriate for hypothesis testing of mean responses. An additional column was provided alongside each audit procedure to be ticked in case of non-applicability.

The third part of the survey instrument provides the respondents with an optional opportunity to contribute written comments on fraud-detecting techniques other than those indicated in the questionnaire that they have used in the stock and warehousing cycle.

2.3 Methodology for data analysis

Three main research themes were pursued in this study as follows:

Effective audit procedures

The mean response of all the respondents on each of the audit procedures was computed. This mean response on each audit procedure measures its degree of effectiveness in detecting fraud as perceived by the respondents. As a supplementary analysis, an overall mean response for the 56 audit procedures was also computed, and used as a benchmark to determine the degree of effectiveness in detecting fraud for each audit procedure. The significant differences between the overall mean and the mean opinion for each audit procedure was tested with a parametric one-sample *t*-test. An audit procedure is, then, categorised either as "more effective", "moderately effective" or "less effective" if its mean response is significant at either 1%, 10%, or not statistically significant respectively, when tested against the overall mean response for the 56 audit procedures using the one-sample *t*-test.

Perceptual differences

To determine if there are any significant perceptual differences among the respondent auditors on the effectiveness of the 56 audit procedures in detecting fraud in stock and warehousing cycle on the basis of: (i) regional location, and (ii) type of audit firm, we tested the

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categories: early and late respondents, and the responses from these two categories were compared. Thus, if there are significant differences in response between early and late respondents, then readers should interpret the results of the study with the effects of non-response bias in mind. The result of our test of non-response bias suggests that there is no significant difference between mean response of early and late respondents.

following null hypotheses with one-way analysis of variance (ANOVA)[4] and two-sample *t*-test respectively:

Hypothesis 1:

Ho: There are no regional perceptual differences on the effectiveness of the standard audit procedures in detecting fraud in stock and warehousing cycle.

Hypothesis 2:

Ho: There are no perceptual differences between Big-5 and non-Big-5 auditors on the effectiveness of the standard audit procedures in detecting fraud in stock and warehousing cycle.

Because the ANOVA is incapable of isolating which regional differences are significant, *a posteriori* Scheffe multiple-comparisons test was used to pinpoint which of the regions examined differ significantly (Siegel and Castellan, 1988).

Audit-specific factors

To investigate the relative influence of: (i) size of audit firm; (ii) position tenure of auditor; (iii) years of experience of auditor; and (iv) practice review experience of auditor's firm on the likelihood of detecting fraud in stock and warehousing cycle, we estimated the following logit regression model:

$$Fraudec_j = \alpha + \beta_1 Size_j + \beta_2 Post_j + \beta_3 Exp_j + \beta_4 \Pr ac_j + \varepsilon_j \qquad (1)$$

Where,

$Fraudec_j$	=	dichotomous variable which is coded 1 if the *j*th auditor has detected fraud in stock and warehousing cycle, and 0 otherwise;
α	=	the constant term of the equation to be estimated;
β_i	=	the coefficient of independent variable to be estimated from the data where $1 \le i \le 4$;
$Size_j$	=	the size of audit firm where the *j*th auditor works;
$Post_j$	=	the position tenure of the *j*th auditor;
Exp_j	=	the years of experience of the *j*th auditor;

[4] Because the assumption of equal variance is not supported by the data, the non-parametric counterpart, Kruskal-Wallis test, was also employed. Gaito (1980, p. 567) emphasises the importance of this requirement for an ANOVA test.

$Prac_j$ = the practice review experience of the *j*th auditor's firm; and

ε = the stochastic disturbance term for the *j*th auditor.

3. Analysis of the Survey Data

Analysis of the survey data is organised under four major headings. The first details the demographic characteristics of our respondents. The second is about the perceptual effectiveness of the 56 audit procedures. The third presents analysis on the perceptual differences between auditors operating in different geographical areas in New Zealand, and the type of audit firm. The fourth concerns auditor-specific factors that influence the likelihood to detect fraud in stock and warehousing cycle.

Respondents' demographic characteristics

As reported in Panels A and B of Table 1, about 93 percent of our respondents are members of the Institute of Chartered Accountants of New Zealand (ICANZ). Of these, 58 percent are in the ICANZ's full membership category, and 27 percent of this figure work with Big-5 audit firms. About 15 percent of our respondents are also qualified with other professional bodies such as the ICAEW, the ACFE, and The Institute of Internal Auditors.

[Insert Table 1 about here]

The number of years our respondents have been in their current positions range from 4 months to 26 years; with the average position tenure being about 4 years. In contrast, our respondents have, on average, eight years of practical experience in auditing. As reported in Panel B of Table 1, there are significant differences between our respondents who are Big-5 and non-Big-5 auditors on a number of variables, including their firm's location, experiencing of practice reviews and stock and warehousing cycle fraud detection experience. The Big 5 firms have experienced significantly more practice reviews, and have detected more stock and warehousing cycle-related frauds than non-Big 5 firms. With respect to individual respondents,

however, no statistically significant differences were found in stock and warehousing cycle fraud detection experience of Big 5 and non-Big 5 auditors.

Effective audit procedures

The results gathered from the survey instrument provide information on the respondents' perception of the relative effectiveness of the 56 standard audit procedures. Our respondents perceive 36 percent (20 of 56) of the standard audit procedures as being "more effective" than the average audit procedure in detecting fraud in stock and warehousing cycle. Table 2 presents the auditors' responses for each of the 20 "more effective" audit procedures in the stock and warehousing cycle. The "more effective" audit procedures are, generally, used to collect direct audit evidence in a typical audit engagement. This suggests that (where possible) they should be applied in the planning stage of an audit. As suggested by Moyes (1996), early indication of possible fraud during the planning stage of an audit would allow auditors to re-plan more effectively, and maximise audit time and resources.

These "more effective" audit procedures were compared with those reported in Moyes (1996) as perceived by US auditors as "more effective" (see the last column of Table 2). The comparative analysis indicates that ten (50%), five (25%), and five (25%) of the "more effective" fraud detecting audit procedures as perceived by New Zealand auditors were evaluated by US auditors as "more effective", "average effective" and "less effective" respectively (Moyes 1996). This suggests that perceptions of individuals are influenced by the environmental factors.

[Insert Table 2 about here]

Table 3 reports those audit procedures evaluated by our respondents as being "moderately effective" in detecting fraud in stock and warehousing cycle. The nine "moderately effective" audit procedures are generally used to verify the accuracy and dependability of a client company's accounting records. Thus, the nine "moderately effective" audit procedures are

substantive procedures used to prove the stock figure as genuine, accurate, and complete. Auditors use these "moderately effective" audit procedures to confirm management's financial statement assertions about the stock and manufacturing costs, as the manufacturing costs are the basis for calculating the cost of stock. Again, the nine "moderately effective" fraud-detecting audit procedures were compared with those perceived as having "average" effectiveness in detecting fraud by the US auditors surveyed by Moyes (1996). The US auditors evaluated more than half of the nine "moderately effective" audit procedures as being "less effective" (see the last column of Table 3).

[Insert Table 3 about here]

The remaining 27 audit procedures evaluated by New Zealand auditors as having "less" effectiveness in detecting fraud in stock and warehousing cycle are presented in Table 4. These audit procedures appear to be those used in collecting audit evidence in an indirect way. They should not exclusively be used in an audit, especially if fraud is suspected. Rather, they should be used to complement those procedures perceived by our respondents as having either of "more" or "average" effectiveness in detecting fraud. Most of the 27 "less effective" fraud-detecting audit procedures are analytical procedures. This result contradicts the general expectation that analytical procedures are useful in indicating client companies that are in severe financial difficulties – situation where managements are more likely to commit fraud. The plausible reason for this result is that evidence gathered with analytical procedures is less objective. Compared with the results reported by Moyes (1996), 74 percent of these "less effective" audit procedures (20 of 27) were perceived by US auditors as having "average" effectiveness in detecting fraud in the stock and warehousing cycle.

[Insert Table 4 about here]

Write-in comments

As stated earlier, respondents were given an opportunity to write in audit procedures other than those in the survey questionnaire that they have used to detect fraud in stock and warehousing cycle. Of the respondents, (32%) provided write-in comments. Comments made by these respondents are summarised in Panel C of Table 1. The most frequent comments deal with control procedures such as ensuring that key staff take holidays when due, and ensuring that there is proper segregation of compatible duties. Other frequent comments mentioned include identifying controls over physical stock count, and attending stocktaking.

Perceptual differences

Panels A and B of Table 5 respectively report the results of the statistical tests performed to determine if there are any perceptual differences between our respondents on the effectiveness of the 56 standard audit procedures in detecting fraud in stock and warehousing cycle on the basis of: (i) the geographical area in New Zealand where respondents' employers are located, and (ii) the type of audit firms employing our respondents.

[Insert Table 5 about here]

Regional perceptual differences

In most cases, our respondents do agree on the degree of effectiveness of the 56 standard audit procedures used in stock and warehousing audit cycle, except for those six instances reported in Panels A of Table 5. Thus, hypothesis 1 can be rejected in 48 of the cases investigated. Of the remaining six cases in which our respondents differ in their perception, a *posteriori* Scheffe multiple-comparisons test indicates that auditors practising in Wellington, and those practising outside the three major centres in New Zealanddiffer significantly on the effectiveness of two audit procedures in detecting fraud.[5]

[5] For brevity, the result of this supplementary analysis is not reported here.

Type of audit firm perceptual differences

Again, our statistical test suggests that there are no significant perceptual differences between Big-5 and non-Big-5 auditors on the effectiveness of the 56 standard audit procedures, except in five instances. Panel B of Table 5 presents these audit procedures, on which our respondents differ on the basis of the type of audit firm employing them. Thus, hypothesis 2 is not substantiated in 49 cases.[6] This result is surprising given that the two types of auditors significantly differ on a number of demographic characteristics examined in this study as reported in Panel B of Table 1. This result raises concern about the economic rent enjoyed by Big-5 audit firms. If Big-5 firms do not significantly differ from non-Big-5 counterparts in their use of audit procedures to detect fraud, why should the Big-5 audit firms enjoy economic rent? Presumably this is because they have valuable reputations, and are perceived as having greater ability to pay damages.

Audit-specific factors

We report the results of the logit regression analysis in Table 6. To avoid the consequences of multicollinearity because of the high correlation between the auditor's years of experience in auditing, and auditor's position tenure variables[7], two logit regression models (Models A and B) were fitted to the data. Model A includes all variables except for auditor's years of experience in auditing, while Model B includes all variables except for auditor's position tenure. Panel B of Table 6 presents the correlation matrix of the audit-specific factors investigated, while the results of the Models A and B[8] are reported in Panels C and D of Table 6 respectively.

[6] In another analysis, the type of audit firm variable was found not to be statistically significant. In this analysis, the type of audit firm was included in equation (1) as a categorical variable where it was coded one if it is a Big-5 audit firm, and zero otherwise.

[7] As reported in Panel B of Table 6, the pairwise correlation coefficient for these variables is 0.80. This suggests a serious multicollinearity problem (Gujarati, 1995). Simultaneous inclusion of these variables in equation (1) results in changes in the signs of some of the parameter estimates.

[8] Because the estimated residuals of the models were serially correlated, logit models with *robust* standard errors were run. Standard errors of parameter estimates of a model with serially correlated residuals are biased, and predictions based on the estimates are inefficient (Koutsoyiannis, 1977).

[Insert Table 6 about here]

The results of Model A indicate that auditor's position tenure, and the size of audit firm are significant at the conventional levels of 1% and 5% respectively. The results of an estimate of Model B indicate that the auditor's years of experience in auditing, and the size of audit firm variables are statistically significant at 1% and 5% levels respectively. The coefficient on the practice review experience of auditor's firm variable is statistically insignificant in both models. It is apparent that the size of audit firm, measured by number of employees, plays a significant role in the likelihood of fraud detection. More employees represent a larger pool of accumulated expertise pertaining to fraud especially in dealing with stock. Hence, the larger the audit firm, the more likely the application of stock and warehousing audit procedures in an audit engagement will locate fraud involving stock. In both models, the coefficients on auditor's position tenure, auditor's years of experience, and the size of audit firm are all of the expected signs, suggesting that these variables positively influence the likelihood to detect fraud in stock and warehousing cycle in New Zealand.

Overall, the results of the regression analysis suggest that size of audit firm, measured by the number of employees, auditor's position tenure, and auditor's years of experience in auditing are significant predictors of the likelihood of detecting fraud in stock and warehousing cycle in New Zealand. The Wald Chi-squared statistic, which is comparable to the *F*-statistic of a multiple regression, tests the hypothesis that all the parameters in the Equation (1) are simultaneously equal to zero. This null hypothesis is not substantiated, as the Wald Chi-squared statistic of the two models is statistically significant at the 1% level. However, the Pseudo *R*-squared, which is comparable to the *R*-squared measure in a multiple regression, at 10% and 13% respectively is not high in both models. We examined the sensitivity of the results of both

models to other specifications, and find the results reported in Panels C and D of Table 6 to be quite robust.[9]

4. Conclusions and Limitations

The major purpose of this study is to explore the degree of effectiveness of 56 standard audit procedures normally applied in the stock and warehousing cycle as perceived by auditors in New Zealand. Further, it investigates the relative influence of the size of audit firm, auditor's position tenure, auditor's years of experience in auditing, and practice review experience of the auditor's firm on the likelihood of detecting fraud in stock and warehousing cycle.

The analysis of the usable questionnaires returned by the auditors surveyed indicates that less than half of the 56 standard audit procedures are perceived by our respondents as being "more effective" than average audit procedures in detecting fraud in stock and warehousing cycle in New Zealand. On the other hand, they evaluated more than half of these procedures as "less effective" in detecting fraud perpetuated in the stock and warehousing cycle in New Zealand.

In addition, a logit regression analysis suggests that the size of audit firm, auditor's position tenure, and auditor's years of experience increase the possibility of detecting fraud in the stock and warehousing cycle. However, practice review experience of auditor's firm was found to make statistically insignificant contribution to the likelihood of detecting fraud in stock and warehousing cycle in New Zealand.

The results reported here should be considered in the light of the following limitations of the underlying research. First, the 56 audit procedures evaluated by our respondents in this study do not represent all the available audit procedures to detect fraud in stock and warehousing

[9] We estimated a probit specification of equation (1) for both Models A and B. The results in each case are very similar to the logit results, and in the interests of brevity, are not reported here. Note that the difference between logit and probit regressions is about the assumption of the distribution of the independent variables. The probit regression requires that the independent variables be normally distributed (Maddala, 1991).

cycle. They are limited to those found in a typical auditing textbook. However, to include all available audit procedures relevant in this transaction cycle would have been impossible. Second, the respondent auditors are assumed to be experts in understanding and applying all these audit procedures. Their perception of the effectiveness of the audit procedures may be affected by the fact that they do not suffer any economic loss. Third, responses to questionnaires by individuals may not always reflect practice. Given the above limitations, caution should be exercised in making generalizations based on the results.

In conclusion, the likelihood of fraud detection in stock and warehousing increases as the auditor acquires more years of auditing experience, and as the audit firm employs more number of staff. Exploring the nature of these relationships, either in other transaction cycles or the same transaction cycle in other countries may be interesting areas for future research.

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Table 1: Analyses of responses to demographic questions and respondents' most frequent write-in comments

Panel A: Metric variables

Response	Obs.	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis
1. No. of years in present audit firm	109	6.55	6.80	0.5	32	1.8563	5.8935
2. Position tenure	110	3.60	4.67	0.3	26	2.7253	10.5727
3. No. of years of experience in auditing	110	7.69	7.27	0.5	35	1.5544	5.2703
4. No. of staff of respondent's employer	110	261.12	882.32	4	8500	7.9822	72.0157
5. No. of years of ICANZ membership of respondents	105	5.63	7.13	0	35	2.0460	6.9975

Panel B: Non-metric variables

Response	Obs.	Mean		t-test	
		Big-5 firm	Non-Big-5 firm	t-value	Prob.
1. Respondents' ICANZ membership type (Full = 1; Provisional = 0)	106	0.5333	0.7609	1.866	0.065
2. Respondents' membership of other professional bodies (Yes = 1; No = 0)	105	0.1333	0.1778	0.249	0.804
3. Respondents' firms experiencing practice review before (Yes = 1; No = 0)	96	0.9273	0.6098	-3.709	0.000
4. Respondents' firms detecting fraud in stock and warehousing cycle before (Yes = 1; No = 0)	95	0.6296	0.3415	-2.555	0.012

5. Respondents detecting fraud in stock and warehousing cycle before (Yes = 1; No = 0)	103	0.1525	0.1591	0.781	0.437
6. Regional location of respondents' firms (Auckland, Wellington, Christchurch and Other = 1, 2, 3 and 4 respectively)	107	2.2000	2.9362	2.575	0.011

Panel C: Analysis of write-in comments (n = 35)

Write-in comment (Some respondents made more than one comment)	No. of respondents	Proportion of total (%)
1. Alterations on stock sheets attracted attention	2	4
2. Review stock security system	4	8
3. Attendance at stocktaking	5	10
4. Random testing outside stocktaking period	2	4
5. Identify controls over physical stock count	6	12
6. Just listening to what other staff have to say	2	4
7. Review variances from standard costs	3	6
8. Compare various margins and test other relationships	4	8
9. General knowledge of and close interaction with client	3	6
10. There is no best way to detect fraud	3	6
11. Audits are not designed to detect fraud	3	6
12. Miscellaneous comments on control procedure (such as key staff taking holidays, segregation of duties, review of purchasing policies, etc.)	13	26

Table 2: Audit procedures evaluated as "more effective" in detecting fraud in stock and warehousing cycle by respondents (Overall mean response = 3.0365)

Audit procedure (By the order of perceived effectiveness)	Mean	Std. dev.	*t*-value	Moyes (1996)
1. Review stock count procedures: [1] accounting for items in transit (in and out); [2] comparison of counts with stock records; and [3] reconciliation of differences between counts and stock records.	3.827	0.985	8.421*	ME
2. Follow up all exceptions to make sure they are resolved.	3.764	1.013	7.568*	ME
3. Perform compilation tests to ensure that stock sheets total schedule agrees with the physical stock counts.	3.609	0.968	6.202*	ME
4. Verify that stock balances on stock sheets agree with perpetual records (stock subsidiary ledger).	3.591	0.980	5.936*	AE
5. Review adequacy of physical security for the entire stock.	3.518	1.098	4.600*	ME
6. Review major adjustments for propriety.	3.509	1.139	4.350*	ME
7. Trace stock listed in the schedule to stock tags and the auditor's recorded counts for existence, description, and quantity.	3.482	1.081	4.319*	ME
8. Review procedures for receiving, inspecting, and storing incoming items and for shipments out of the warehouse.	3.482	0.955	4.889*	ME
9. Determine if access to stock area is limited to only authorised personnel.	3.418	1.035	3.867*	ME
10. Re-count a sample of client's counts to make sure the recorded counts are accurate on the tags (also check descriptions and unit of count, such as dozen or gross).	3.400	1.167	3.267*	ME
11. Observe the physical count of stock at all locations.	3.318	1.125	2.627*	ME
12. Compare current manufacturing costs with previous year's.	2.764	1.074	-2.664*	LE
13. Review contracts with suppliers and customers and enquire of management about the possibility of the inclusion of consigned or other non-owned stock, or of owned that is not included.	2.736	0.983	-3.202*	AE

14. Compare the count of larger items stated on the tags to the counts in the prior year and the perpetual stock records.	2.727	1.108	-2.927*	AE
15. Evaluate whether the percentage of completion recorded on the tags for work in progress is reasonable.	2.591	1.016	-4.598*	AE
16. Compare extended stock value with previous year's.	2.536	1.089	-4.815*	LE
17. Test direct labour costs by comparing with labour payroll and union contracts.	2.536	1.217	-4.311*	LE
18. Send confirmations to lenders for pertinent details about warehouse receipts pledged as collateral for liabilities.	2.482	1.359	-4.279*	AE
19. Test number of hours needed to manufacture the product by comparing with engineering specifications.	2.409	1.214	-5.421*	LE
20. Examine financial statements for: [1] proper separate disclosure of raw materials, work in progress and finished goods; [2] proper description of the stock costing method; [3] inclusion of significant sales and purchase commitments; and [4] proper description of pledged stock.	2.327	1.257	-5.918*	LE

Note: ME = Among the 14 audit procedures evaluated as "more effective" by US auditors in Moyes (1996).
AE = Among the 27 audit procedures evaluated as "average effective" by US auditors in Moyes (1996).
LE = Among the 15 audit procedures evaluated as "less effective" by US auditors in Moyes (1996).

* = Significant at the 1% level (two-tail test).

Table 3: Audit procedures evaluated as "moderately effective" in detecting fraud in stock and warehousing cycle by respondents (Overall mean response = 3.0365)

Audit procedure (By the order of perceived effectiveness)	Mean	Std. dev.	*t*-value	Moyes (1996)
1. Obtain written confirmation of stocks in public warehouses.	3.245	1.118	1.959*	ME
2. Review related party transactions involving stock movements.	3.227	1.155	1.733*	ME
3. Trace from stock tags to the stock sheets and make sure stock on tags are included.	3.209	1.032	1.753*	AE
4. Observe that non-owned goods are either identified or segregated.	2.864	1.062	-1.707*	AE
5. Check the additions of the stock sheets for raw materials, work in progress, and finished goods.	2.836	1.088	-1.929*	LE
6. Extend the physical stock counts times the price on selected items on the stock summaries.	2.809	1.062	-2.246**	LE
7. Account for the direct material costs, direct labour costs, and overhead costs involved in the valuation of manufactured stocks.	2.809	1.079	-2.210**	LE
8. In pricing stock, consider whether historical or replacement cost is lower.	2.773	1.254	-2.207**	LE
9. Compare unit costs of stock determined either with FIFO, LIFO or AVCO valuation methods with previous year's.	2.736	1.201	-2.620**	LE

Note: ME = Among the 14 audit procedures evaluated as "more effective" by US auditors in Moyes (1996).
AE = Among the 27 audit procedures evaluated as "average effective" by US auditors in Moyes (1996).
LE = Among the 15 audit procedures evaluated as "less effective" by US auditors in Moyes (1996).

* = Significant at the 10% level (two-tail test).

** = Significant at the 5% level (two-tail test).

Table 4: Audit procedures evaluated as "less effective" in detecting fraud in stock and warehousing cycle by respondents (Overall mean response = 3.0365)

Audit procedure (By the order of perceived effectiveness)	Mean	Std. dev.	*t*-value†	Moyes (1996)
1. Test pricing by tracing unit costs from vendors' invoices to the perpetual stock records.	3.218	1.160	1.642	AE
2. Perform purchases cut-off test to ensure that goods in transit on F.O.B. shipping point basis are recorded as purchases and included in stock.	3.154	1.110	1.115	AE
3. Trace shipments to sales records, stock records, and bills of lading (shipping documents).	3.145	1.074	1.064	ME
4. Identify slow-moving, obsolete, or damaged items within the stock.	3.136	1.062	0.986	AE
5. Trace balances of stock-listing schedules to the general ledger.	3.127	1.110	0.858	AE
6. Record client's counts for subsequent testing.	3.118	1.115	0.768	AE
7. Perform analytical procedures by computing ratios and comparing them with previous year's.	3.109	1.176	0.647	AE
8. Verify pricing by locating the appropriate and sufficient invoices to account for the entire quantity of stock for the particular item being tested, especially for FIFO valuation method.	3.091	1.146	0.498	LE
9. Review warehouse records for duplicate locations for the same items.	3.091	1.019	0.560	AE
10. Review policies regarding stock returns.	3.082	1.059	0.448	AE
11. Tour warehouse facilities and become familiar with storage, marking, and location procedures.	3.054	1.012	0.187	AE
12. Observe that damaged or obsolete goods are valued at net realizable value.	3.054	1.099	0.172	AE
13. Review the last shipping document used at year-end and make sure the stock for that item was excluded from the physical count.	3.027	1.281	-0.076	AE
14. Trace stock tags identified as non- owned during the physical observation to the stock-listing schedule to make sure that they have not been included.	3.018	1.149	-0.167	AE
15. Enquire about stocks in other locations, on consignment or on sale or return basis.	3.009	1.096	-0.262	AE
16. Account for all used and unused tags to make sure none are lost, added or intentionally omitted (record tag numbers for those used and unused for subsequent follow-up).	2.991	1.145	-0.418	AE
17. Trace shipments to sales daybooks.	2.982	1.165	-0.492	ME
18. Compare current stock levels and values with previous year's and evaluate.	2.954	1.078	-0.797	LE
19. Review the last shipping document used at year-end to make sure the stock for that item was excluded from the physical count.	2.945	1.240	-0.770	AE
20. If a standard cost system is used, determine if the valuation method is efficient and useful by reviewing and analysing the variances.	2.936	1.034	-1.016	LE
21. Discuss with client management the stock and warehousing cycle.	2.936	1.144	-0.919	LE
22. Examine shipping area for stock set aside for shipment, but not counted.	2.918	1.068	-1.162	AE

23. Draw flow chart of internal control system and compare with written policies.	2.900	1.180	-1.213	AE

Table 4 (Contd.): Audit procedures evaluated as "less effective" in detecting fraud in stock and warehousing cycle by respondents (Overall mean response = 3.0365)

Audit procedure (By the order of perceived effectiveness)	Mean	Std. dev.	*t*-value†	Moyes (1996)
24. Determine whether costs should be included in the valuation of a particular item of purchased stock such as freight, storage, discounts, and other costs and compare the findings with the prior year's audit working papers to make sure the valuation methods are consistent.	2.891	1.136	-1.344	LE
25. Examine stock descriptions on the tags and compare to the actual stock for raw materials, work in progress, and finished goods.	2.882	1.081	-1.500	AE
26. Compare the classification of raw materials, work in progress, and finished goods by comparing the description on stock tags and the auditor's recorded test counts to the stock-listing schedule.	2.873	1.158	-1.483	AE
27. Examine receiving area for stock that should be included in the physical count.	2.864	1.121	-1.618	AE

Note: ME = Among the 14 audit procedures evaluated as "more effective" by US auditors in Moyes (1996).
AE = Among the 27 audit procedures evaluated as "average effective" by US auditors in Moyes (1996).
LE = Among the 15 audit procedures evaluated as "less effective" by US auditors in Moyes (1996).

† = None of the *t*-values is statistically significant at the conventional levels.

Table 5: Auditors' perceptual differences on the effectiveness of audit procedures in detecting fraud in stock and warehousing cycle

Panel A: By area of location: Auckland v. Wellington v. Christchurch v. "Others" **(n=110)**

Audit procedure	Anova test		Kruskal-Wallis test	
	F-statistic	**Prob.**	**Chi-squared**	**Prob.**
1. Review contracts with suppliers and customers and enquire from management about the possibility of the inclusion of consigned or other non-owned stock, or of owned that is not included.	2.95	0.0359††	7.153	0.0672
2. Examine receiving area for stock that should be included in the physical count.	2.28	0.0839	7.557	0.0561
3. Observe that non-owned goods are either identified or segregated.	2.29	0.0828	6.078	0.1079†
4. Verify pricing by locating the appropriate and sufficient invoices to account for the entire quantity of stock for the particular item being tested, especially for FIFO valuation method.	3.84	0.0118†††	12.162	0.0068
5. In pricing stock, consider whether historical or replacement cost is lower.	2.36	0.0759	6.949	0.0736
6. Check the additions of the stock-listing schedules for raw materials, work in progress, and finished goods.	2.14	0.0997	7.085	0.0692

Panel B: By auditor-type: Big-5 v. non-Big-5 **(n=104)**

Audit procedure	t-test		Mann-Whitney test	
	t-value	**Prob.**	**Z-statistic**	**Prob.**
1. Enquire about stocks in other locations, on consignment or on sale or return basis.	1.780	0.0749	1.796	0.0725
2. Trace balances of stock-listing schedules to the general ledger.	-1.927	0.0567	-1.787	0.0739
3. Identify slow-moving, obsolete, or damaged items within the stock.	1.758	0.0817	1.656	0.0978
4. Review major adjustments for propriety.	1.615	0.1094†	2.262	0.0237
5. Review related party transactions involving stock movements.	2.445	0.0162	2.188	0.0286

Note: † = Not significant at any of the conventional levels.

†† = Scheffe multiple-comparisons test shows that auditors located in Wellington and those in "Other" areas in New Zealand differ significantly on this audit procedure at the 10% level.

††† = Scheffe multiple-comparisons test shows that auditors located in Wellington and those in "Other" areas in New Zealand differ significantly on this audit procedure at the 5% level.

Table 6: Results of Logit Regression

Model: $Fraudec_j = \alpha + \beta_1 Size_j + \beta_2 Post_j + \beta_3 Exp_j + \beta_4 \Pr ac_j + \varepsilon_j$

Panel A: Descriptive statistics of auditor-specific factors

Variable	Notation in model	Obs.	Mean	Std. Dev.	Min.	Max.
No. of employees	$Size_j$	110	261.1273	882.3187	4	8500
Position tenure (years)	$Post_j$	110	3.6018	4.6703	.3	26
Years. of experience	Exp_j	110	7.6873	7.2697	.5	35
Practice review	$Prac_j$	110	.7545	.4323	0	1

Panel B: Correlation matrix of auditor-specific factors

Variable	No. of Employees	Position tenure	Years of experience	Practice Review
No. of employees	1.0000	-0.0371	0.0062	-0.0819
Position tenure (years)	-0.0371	1.0000	0.7997*	0.0956
Years of experience	1.0062	0.7997*	1.0000	0.0883
Practice review	-0.0819	0.0956	-0.0819	1.0000

***Panel C: Model A* (*All variables included except for auditor's years of experience*)**

Logit estimates — Number of observations = 110; Wald Chi-squared(3) = 15.26; Prob. > Chi-squared = 0.0016; Log likelihood = -48.058963; Pseudo R-squared = 0.1039

$Fraudec_j$	Coefficient	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$Size_j$ (+)	.0003806	.000171	2.226	0.026	.0000454	.0007158
$Post_j$ (+)	.1345041	.0418246	3.216	0.001	.0565694	.2164788
$Prac_j$ (+)	.3647092	.6383185	0.571	0.568	-.8863721	1.61579
Constant (?)	-2.428866	.5750908	-4.223	0.000	-3.556024	-1.301709

***Panel D: Model B* (*All variables included except for auditor's position tenure*)**

Logit estimates — Number of observations = 110; Wald Chi-squared(3) = 15.87; Prob. > Chi-squared = 0.0012; Log likelihood = -46.827845; Pseudo R-squared = 0.1268

$Fraudec_j$	Coefficient	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
$Size_j$ (+)	.000358	.0001672	2.141	0.032	.0000302	.0006857
Exp_j (+)	.1040997	.0315567	3.299	0.001	.0422498	.1659497

$Prac_j$ (+)	.3691132	.643012	0.574	0.566	-.8911671	1.629393
Constant (?)	-2.799416	.6243265	-4.484	0.000	-4.023073	-1.575758

Note: * = Significant at the 1% level (two-tail test).