



# Perceived effectiveness of fraud detection audit procedures in a stock and warehousing cycle

Fraud detection  
audit procedures

## Additional evidence from Barbados

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Received 14 August 2009  
Revised 23 February 2010  
Accepted 10 March 2010

### Abstract

**Purpose** – The purpose of this paper is to explore perceptions of fraud detection techniques in the stock and warehouse cycle in Barbados.

**Design/methodology/approach** – The study uses a self-administered questionnaire, adapted and modified from Owusu-Ansah *et al.* The sample is comprised of 64 auditors. The study examines the perceived effectiveness of audit procedures, the influence of size of the audit firm, and the level of audit experience in the choice of specific audit procedures.

**Findings** – The study indicates that there is a moderate to high perceived effectiveness of standard audit procedures in the detection of fraud in the stock and warehousing cycle in Barbados and that the majority of the “more effective” audit procedures can be classified as field research techniques that are more direct in obtaining evidence. It is found that auditors from larger firms reported higher means for audit procedures. There are mixed findings with respect to the significant relationship between level of auditing experience of auditors and perceived effectiveness of fraud detection techniques. The study also indicates that males consistently rated the level of effectiveness of audit procedures higher than females.

**Research limitations/implications** – Due to the relatively small sample size, these findings should be interpreted with caution. Nonetheless, the findings of this study do indicate that auditing procedures in this developing country are on par with those of developed countries.

**Practical implications** – This paper serves to inform audit-related policies and regulation on the potential threats within the stock and warehouse cycle.

**Originality/value** – This paper contributes to the limited body of research on fraud detection within the stock and warehouse cycle in small developing countries.

**Keywords** Barbados, Warehousing, Stock control, Fraud, Auditing, Developing countries

**Paper type** Research paper

### Introduction

The global increase in accounting fraud and corruption has necessitated an increased demand for stronger and more effective accounting and audit procedures. The Association of Certified Fraud Examiners (ACFE) in their survey for 2008 estimated that US firms lose 7 percent of their annual income to fraud, resulting in approximately



Managerial Auditing Journal  
Vol. 25 No. 6, 2010  
pp. 553-568

© Emerald Group Publishing Limited  
0268-6902

DOI 10.1108/02686901011054863

The authors wish to thank two anonymous reviewers of an earlier version of this paper for their helpful comments.

\$994 billion in losses (ACFE, 2008). The emphasis on the stock and warehouse cycle is of great significance because stock (inventory) comprises a large portion of most companies' corporate assets. Moreover, since stock is often stored in several locations, this tends to complicate physical control and counting. Additionally, the number of employees with access to stock, as well as the wide array of stock valuation methods, makes stock quite susceptible to fraud. The aforementioned issues mandate that auditors become increasingly vigilant in their audit of stock, not only to safeguard stakeholders' interests, but also to reduce the risk of litigation and preserve the credibility and integrity of the audit profession in the eyes of the public.

Today, businesses are paying greater attention to high balance sheet items. This increased vigilance had emerged in direct response to the number of stock frauds, coupled with the high associated costs of such frauds, as well as the penalties for those involved in such fraud. There have been publicized cases of fraud in companies such as Fortex Group Limited, McKesson and Robbins, Rite Aid, Crazy Eddie Inc., and Miniscribe Corporation. The collapse of Fortex Group Limited was partly due to fraud in the stock and warehousing cycle (Owusu-Ansah *et al.*, 2002). In the case of McKesson and Robbins in 1939, it was discovered that there were fictitious inventories and accounts receivable in the financial statements of the company (Macfie, 1996; Albrecht *et al.*, 2009). This case made it mandatory for auditors to attend stocktaking (Arens *et al.*, 2008). In Rite Aid's case, senior management engaged in inflating the value of damaged and outdated goods as a means of increasing income (Makkawi and Schick, 2003). In the 1980s, Crazy Eddie Inc. could not explain \$65 million in missing inventory due to phony inventory sheets and improperly included inventory in its accounts (Albrecht *et al.*, 2009, p. 422). In 1989, it was discovered that Miniscribe Corporation's management inflated inventory by creating fictitious inventory in transit amounts and recording a transfer of \$9 million in nonexistent inventory (Albrecht *et al.*, 2009, p.420). These are only a few examples of the many companies that would have suffered a similar fate. Such scandals have served to highlight the importance of vigilant auditors in the stock and warehousing cycle. Moreover, the increase in stock fraud has mandated that auditors utilize much more creative techniques and strategies in order to uncover potential fraud.

In order to set the context for the discussion of fraud in the stock and warehousing cycle, it is important that a distinction be made between error and fraud. Errors can also be mistaken for fraud and the Auditing Standards Board (ASB) of the American Institute of Certified Public Accountants Statement on Auditing Standard (SAS) No. 82 (AU 316) distinguishes between two types of misstatements which can be either material or immaterial. An error is an unintentional misstatement of the financial statements, whereas fraud is intentional. An example of an error is a mistake in extending prices times quantity on an invoice.

In recent times, much attention has focused on management fraud and on the failure of auditors to detect and report the fraud. As highlighted above, the literature provides ample evidence of fraudulent activities especially in the USA (e.g. Albrecht *et al.*, 2009; Arens *et al.*, 2008). Such fraud has caused a loss of public confidence in audited financial statements, and has mandated the need to reconsider the procedures performed to uncover fraud in current and future financial statement audits. To meet this need and to serve as the cornerstone of its anti-fraud program, ASB issued SAS No. 99, "Consideration of Fraud in a Financial Statement Audit," which superseded SAS No. 82. SAS No. 99 enhances the accounting profession's most decisive steps in combating fraud.

Although the auditor's responsibility for detecting fraud has not changed from SAS No. 82, the amended standard provides more guidance on how the auditor should plan and perform the audit (including the use of analytical procedures) to identify the risks of material misstatements arising from errors or fraud (Albrecht *et al.*, 2009; Arens *et al.*, 2008).

This paper seeks to explore the use of audit techniques in detecting fraud, especially in the stock and warehousing cycle in a small developing country. This study contributes to the paucity of research on fraud on stock areas in small countries (e.g. Alleyne and Howard, 2005). Furthermore, to the best of the authors' knowledge, we are not aware of any research on this area within the English-speaking Caribbean.

There have been several studies in large developed countries on this topic (Makkawi and Schick, 2003; Moyes, 1996; Owusu-Ansah *et al.*, 2002). However, little is known of fraud detection procedures outside the developed countries. The paper therefore contributes to the existing body of knowledge on fraud detection procedures by providing additional evidence from Barbados, a small emerging market. Thus, this study assesses the degree of perceived effectiveness of 56 standard audit procedures in fraud detection that are considered to be applicable to the stock and warehousing cycle in Barbados.

This paper extends current research in the area by examining the influence of auditors' experience and audit firm size on fraud detection techniques in the stock and warehouse cycle. Furthermore, the study performs a comparison with the Owusu-Ansah *et al.* (2002) study to determine whether time has influenced the change in techniques and behavior of auditors, given the increased publicity of fraud which has currently undermined the confidence in the financial markets.

The rest of this paper is structured as follows: The first section selectively reviews the audit literature on fraud detection. The next section explains the research methodology, the following section presents the findings and analysis and the final section concludes the study by setting out the conclusions, limitations, and further research.

## Literature review

### Definition

Fraud can be described as a crime of obtaining money or some other benefit by deliberate deception. In auditing, fraud occurs when a misstatement is made and there is both the knowledge of its falsity and the intent to deceive. Vanasco (1998) explained that fraud includes intentional deception of irregularities and illegal acts. Alleyne and Howard (2005) suggested that fraud included intentional deception, cheating and stealing.

There are two types of fraud in auditing, namely misappropriation of assets (defalcation) and management fraud (Arens *et al.*, 2008). Misappropriation of assets, commonly termed as employee fraud, is characterized by assets being stolen from the company (Albrecht and Romney, 1986). An example of this is where a worker takes stock from the warehouse without recording the entry. Management fraud – the second type of fraud – is essentially fraudulent financial reporting or misapplication of accounting principles. An example would be an overstatement of ending inventory on the balance sheet to show more stock on hand than is actually there, thus intentionally overstating assets and revenues. As a result of fraudulent activities occurring in Enron, WorldCom and other companies, the Sarbanes-Oxley Act of 2002 has required that internal controls be reviewed and that adequate fraud detection and prevention

systems be implemented (Albrecht *et al.*, 2009). This suggests that fraud detection must be high on the auditors' agenda.

#### *Prior research*

The area of fraud detection is particularly important from a shareholder's perspective; all shareholders want to protect their investments and want to be reassured that the assets of the company are correctly stated and safeguarded. Similarly, prospective investors also want to know that they are not only investing in sound companies, but that these companies will continue to remain viable and profitable in the future. The aforementioned issues reinforce the responsibility of auditors to provide reasonable assurance of financial information to society (Makkawi and Schick, 2003). Cases such as Crazy Eddie and McKesson and Robbins have served to highlight the issue of fraud to such an extent that new standards have been introduced globally to address these problems. In light of these developments, it is important that auditors are even more vigilant in the execution of their responsibilities by ensuring that due diligence and care is at the forefront of their agenda so that fraud can be detected and exposed. This is critically important, if auditors are to protect and preserve their professional reputation and integrity and avoid legal costs.

The decade of the 1990s witnessed a substantial increase in fraud. According to the UK Audit Commission, frauds have increased by approximately 38 percent since 1990 (Tyler, 1997 as cited in Owusu-Ansah *et al.*, 2002). This increase in fraud has led to a corresponding increase in the dollar value associated with fraud. For example, a study by the ACFE in the USA revealed that over a ten-year period the cost associated with 2,608 reported fraud cases totaled US\$15 billion (Owusu-Ansah *et al.*, 2002).

The media has reported several allegedly fraudulent financial statements attributed to significant inventory misstatements. Vanasco (1998) reported that the rise in inventory fraud is one of the biggest single reasons for the proliferation of accounting scandals. Most research (Romney *et al.*, 1980; Pincus, 1989) concerning fraud detection has focused primarily on so-called red flags – a body of literature which originated as a direct response to detect and deter fraud. Red flags are described as conditions or circumstances that indicate or highlight potential fraud situations. Moyes and Hasan (1996) concluded that the use of red flag questionnaires caused increased auditor comprehension and uniformity in data collection, as well as assisted auditors in assessing the risk of fraud during the planning stage of the financial statement audits. Although red flags provide some insight into the likelihood of fraud occurring, they have nonetheless been criticized for being too general and are difficult to operationalize in empirical research (Owusu-Ansah *et al.*, 2002). Alleyne and Howard (2005) found that users perceived that fraud detection was the auditors' responsibility and that companies who had internal auditors, sound internal controls and effective audit committees were better equipped to deal with fraud prevention and detection.

#### *Perceived effectiveness of fraud-detecting audit procedures*

Several empirical studies on the likelihood of detecting fraud have examined the use of the audit procedures in an audit engagement (Moyes and Baker, 1995; Moyes, 1996; Moyes and Hasan, 1996; Moyes and Lavine, 1997). Moyes (1996) found that audit procedures that directly collect evidence are seen as more effective than those that indirectly collect evidence and test stock valuation. Owusu-Ansah *et al.* (2002) tested

the perceived effectiveness of 56 fraud-detecting audit procedures used in the stock and warehousing cycle in New Zealand. They found that less than half of the 56 standards procedures were perceived as being “more effective” in detecting fraud, while more than half were seen as “moderately effective”. A total of 15 audit procedures were perceived as being “less effective.” Overall, these studies found varying levels of effectiveness of standard audit procedures and indicated that audit procedures that directly collect evidence seemed to be much more effective compared to those that indirectly collect evidence and test stock valuation. It is important to note that the aforementioned studies examined audit tests which were conducted primarily within large industrialized developed countries, namely, the USA and New Zealand. Empirically, the research shows that there are varying levels of perceived effectiveness of audit detection procedures. Thus, our first research question (RQ) explores:

*RQ1.* Which standard audit procedures are perceived as most effective in detecting fraud in the stock and warehousing cycle?

#### *The size of audit firms, audit experience and fraud detection audit procedures*

Other research on the likelihood of detecting fraud has examined the use of audit procedures to detect fraud in an audit engagement. These studies found that auditing experience of auditors, as well as the size of an audit firm are significant factors in fraud detection (Moyes and Hasan, 1996; Moyes, 1996). For example, Moyes and Hasan (1996) found that in the stock and warehousing cycle, the size of the audit firm is associated with a higher probability of detecting fraud. Similarly, Owusu-Ansah *et al.* (2002) found that the size of the firm positively influenced the likelihood of detecting fraud in the stock and warehouse cycle. According to these authors, larger firms will have large pools of accumulated expertise which ought to make these firms more experienced in fraud detection. Additionally, Salehi *et al.* (2009) also argue that larger firms have superior technology, better financial resources, and more talented staff to perform large audits compared to smaller audit firms. Thus, we argue that being an auditor in a large audit firm should create not only awareness – but also knowledge sharing – on which audit procedures are most effective. Intuitively, large audit firms and more experienced auditors are likely to use more appropriate fraud detection audit procedures. Thus, we explore the next two RQs:

*RQ2.* Are there differences in perceptions in the effectiveness of standard audit procedures in detecting fraud in the stock and warehouse cycle between large and small firms?

*RQ3.* Is there a significant relationship between audit experience and perceptions of effectiveness of standard audit procedures?

#### *Perceived effectiveness and gender*

The audit and ethics literature is filled with studies that measure gender differences. For example, within the ethics literature, it has been suggested that females are more ethically inclined than males (Gilligan, 1977). Sweeney (1995) also found that females were more ethically sensitive than males. Can this be translated into fraud detection? More importantly, can this be applied to what Moyes (2007) proposed, namely, that there may be a relationship between the genders such that one gender may be more likely to overlook or have different perceptions on fraud techniques or obvious red flags?

Moyes (2007) found that males rated the red flags effectiveness consistently lower than females. With respect to resolving complex tasks, Chung and Monroe (2001) found that females performed better than males. Thus, in this study, we explore the fourth RQ:

*RQ4.* Are there differences in the perceived level of effectiveness of standard audit procedures in detecting fraud in the stock and warehouse cycle between male and female auditors?

## Methodology

### *Research setting*

This study gathered information from auditors in Barbados. Barbados is a small open economy, with a relatively sociable and friendly atmosphere. The economy is generally a stable one, and there have been few reported cases where the credibility of auditors has been questioned. Audits are mandated by law for registered companies, and the business sector is serviced by the leading international audit firms, smaller local firms and a number of local sole practitioners.

In Barbados, the generally accepted auditing standards (GAAS) provide the basis for examining financial statements, carrying out of audit procedures and issuing of opinions on the financial statements to determine conformity with GAAP (Alleyne *et al.*, 2006). The Barbados Companies Act Chapter 308, Sections 153-156, outlines the qualifications, disqualifications, appointment and dispensing of the auditor. According to the act, the auditor must be fully qualified, competent and must have been issued a practicing certificate from the Institute of Chartered Accountants of Barbados (Alleyne, 2002). The Sarbanes-Oxley Act of 2002 has also been adopted as part of the auditor's regulations within the island.

### *Sample selection*

The sampling frame for this study was the local Institute of Chartered Accountants membership directory which comprised 400 members. The data collection technique employed for this study was a self-administered questionnaire. The use of a questionnaire approach was adopted, similar to research done by Owusu-Ansah *et al.* (2002) in New Zealand. Questionnaires were sent to 250 chartered accountants. The auditors selected ranged from those practicing at the leading international firms in Barbados, smaller audit firms and sole practitioners. The response rate was low ( $n = 64$ ); nonetheless, it exceeded the minimum sample size requirements ( $n = 30$ ) needed for certain statistical tests as suggested by Saunders *et al.* (2003).

The questionnaire was divided into two parts. Part 1 dealt with the demographic characteristics of the respondents, namely, audit group, qualifications, years of experience, job title, gender and age. Part 2 addressed respondents' opinions on the degree of effectiveness of 56 standard fraud-detecting audit procedures, applicable to the stock and warehousing cycle, as used by Owusu-Ansah *et al.* (2002). All questions in this section used a five-point Likert scale, ranging from 1 – extremely ineffective to 5 – extremely effective.

The study focused on four RQs as stated in the literature review. The perceived effectiveness of the audit procedures was analyzed into three levels: "more effective", "moderately effective" and "less effective", and the overall mean response was used to determine the degree of effectiveness of each audit procedure in detecting fraud. The data were analyzed using one-sample *t*-tests and the independent samples *t*-tests

to determine the statistical significance of the procedures. Similar to Owusu-Ansah *et al.* (2002, p. 194), “an audit procedure was classified as “more effective”, if its mean response exceeded the overall mean response by a significant difference.” An audit procedure was classified as being moderately effective if its mean response exceeded the overall mean but was not statistically significant. Finally, an audit procedure was classified as being “less effective” if its mean response was below the overall mean response and was insignificant.

## Results

### *Characteristics of the sample*

Table I presents the demographic descriptive statistics for the study. The sample comprised 42.2 percent auditors from the large audit firms, while the remaining 57.8 percent were from small firms. Approximately 41 percent of the respondents were males and 59 percent were females. Respondents had an average of six years of employment in their present job, compared to the Owusu-Ansah *et al.* (2002) study which had a mean of seven years. The average audit experience for respondents was seven years, which was slightly below the average of eight years for the Owusu-Ansah *et al.* (2002) study. All respondents held either an accounting degree or a professional accreditation.

### *Perceived effectiveness of audit procedures*

Table II presents the means and standard deviations on the perceived effectiveness of the 56 standard audit procedures. The results indicate that the overall mean for effectiveness of standard audit procedures in the detection of fraud in the stock and warehousing cycle was 3.773, which was higher than the mean of 3.036 found in the Owusu-Ansah *et al.* (2002) study.

### *More effective techniques*

Further analysis revealed that 21 of the 56 standard audit procedures were found to be statistically significant ( $p < 0.05$ ). This indicates that 37.5 percent of the procedures

	<i>n</i> = 64	%
<i>Gender</i>		
Male	26	40.6
Female	38	59.4
<i>Age (years)</i>		
20-29	23	35.9
30-39	24	37.5
40-49	17	26.6
<i>Audit experience</i>		
Mean = 6.59 years		
<i>Auditors by firms</i>		
Large firms	27	42.2
Small firms	37	57.8
<i>Experienced fraud</i>		
Yes	29	45.3
No	35	54.7

**Table I.**  
Demographic descriptive  
statistics

Audit procedure (by the order of perceived effectiveness)	Mean	SD	t-value
1. Recount 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)	4.359 <sup>a</sup>	0.651	7.196 <sup>**</sup>
2. Observe the physical count of stock at all locations	4.297 <sup>a</sup>	0.683	6.135 <sup>**</sup>
3. Trace stock listed in the schedule to stock tags and the auditor's recorded counts for existence, description and quantity	4.297 <sup>a</sup>	0.790	5.298 <sup>**</sup>
4. Trace from stock tags to the stock sheets and make sure to stock on tags are included	4.297 <sup>a</sup>	0.525	7.978 <sup>**</sup>
5. Verify that stock balances on stock sheets agree with perpetual records (stock subsidiary ledger)	4.234 <sup>a</sup>	0.584	6.315 <sup>**</sup>
6. Examine financial statements for: proper separate disclosure of raw materials, work in progress and finished goods; proper description of the stock costing method; inclusion of significant sales and purchase commitments; proper description of pledged stock	4.219 <sup>a</sup>	0.678	5.257 <sup>**</sup>
7. Perform compilation tests to ensure the stock sheets total schedule agree with the physical stock count	4.141 <sup>a</sup>	0.587	5.002 <sup>**</sup>
8. Review adequacy of physical security for the entire stock	4.141 <sup>a</sup>	0.639	4.597 <sup>**</sup>
9. Follow up all exceptions to ensure they are resolved	4.125 <sup>a</sup>	0.519	5.415 <sup>**</sup>
10. Determine if access to stock area is limited to only authorized personnel	4.109	0.779	3.450 <sup>**</sup>
11. Perform a purchases cut off test to ensure that goods in transit on free-on-board (FOB) shipping point basis are recorded as purchased and included in stock	4.109	0.441	6.099 <sup>**</sup>
12. Extend the physical stock counts times the price on selected items on the stock summaries	4.078	0.543	4.485 <sup>**</sup>
13. Enquire about stocks in other locations, on sale or consignment or return basis	4.047	0.452	4.842 <sup>**</sup>
14. Observe that non-owned goods are either identified or segregated	4.047	0.653	3.351 <sup>**</sup>
15. Examine receiving area for stock that should be included in the physical count	4.000	0.471	3.846 <sup>**</sup>
16. Trace shipments to sales records, stock records and bills of lading (shipping documents)	4.000	0.756	2.398 <sup>*</sup>
17. Trace stock tags identified as non-owned during the physical observation to the stock-listing schedule to make sure they have not been included	4.000	0.756	2.398 <sup>*</sup>
18. Tour warehouse facilities and become familiar with storage markings and location procedures	3.984	0.630	2.680 <sup>**</sup>
19. Review the last shipping document used at year-end to make sure stock for that item has been excluded from count	3.969	0.435	3.590 <sup>**</sup>
20. Examine shipping area for stock set aside for shipment, but not counted	3.969	0.435	3.590 <sup>**</sup>
21. Review stock count procedures: accounting for items in transit (in and out); comparison of counts with stock records; and reconciliation of differences between counts and stock records	3.938 <sup>a</sup>	0.467	2.810 <sup>**</sup>

**Table II.**

Audit procedures perceived as "more effective" in detecting fraud in the stock and warehousing cycle

Notes: <sup>\*</sup> $p > 0.05$ ; <sup>\*\*</sup> $p > 0.01$ ; <sup>a</sup>procedures also seen as "more effective" in Owusu-Ansah *et al.* (2002) study; overall mean response = 3.773



were considered “more effective” in detecting fraud within the inventory and warehousing cycle (Table II). Most of these procedures that were seen as “more effective” can be classified as field research techniques that are more direct in obtaining evidence. These “more effective” procedures included: recounting a sample of clients counts, observing physical counts, tracing stock lists and stock tags, verifying stock balances, examining financial statements for proper disclosure and performing compilation tests. Barbadian respondents perceived a larger percentage of procedures as being more effective (37.5 percent) compared to 28.6 percent in Owusu-Ansah *et al.*'s (2002) study.

Moyes (1996) suggested that an early indication of possible fraud during the planning stage of an audit would allow for more effective re-planning and maximization of time and resources. This suggests that those procedures perceived as “more effective” should be utilized in the planning stage by auditors and can be used to prove that the stock figures are genuine, accurate, and complete. In addition, our findings showed that ten of these procedures which were deemed more effective were similar to the New Zealand study.

#### *Moderately effective techniques*

Table III shows the audit procedures perceived as being “moderately effective” in detecting fraud in the stock and warehouse cycle. As previously explained, moderately effective was defined as those procedures which were above the mean of 3.773, but were not statistically significant. Nine audit procedures were perceived to be moderately effective. It was found that audit procedures perceived as moderately effective included tracing balances of stock listing schedules, reviewing major adjustments, accounting for all used and unused tags, testing valuation in a standard costing system, and valuation

Audit procedure (by the order of perceived effectiveness)	Mean	SD	t-value
1. Trace balances of stock listing schedules to the general ledger	3.953 <sup>a</sup>	0.722	1.991
2. Review major adjustments for propriety	3.938	0.774	1.696
3. 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)	3.922 <sup>a</sup>	0.741	1.603
4. If a standard cost system is used, determine if the valuation method is efficient and useful by reviewing and analyzing the variances	3.906 <sup>a</sup>	0.791	1.343
5. Review-related party transactions involving stock movement	3.906	0.583	1.822
6. Check the additions of the stock sheets for raw materials, work in progress and finished goods	3.875	0.577	1.408
7. Test pricing by tracing from unit costs vendors' invoice to the perpetual stock records	3.828 <sup>a</sup>	0.725	0.604
8. Identify slow-moving, obsolete or damage items within the stock	3.797 <sup>a</sup>	0.839	0.224
9. Perform analytical procedures by computing ratios and comparing them with the previous year's	3.797 <sup>a</sup>	0.739	0.254

**Notes:** \* $p > 0.01$ ; \*\* $p > 0.05$ ; <sup>a</sup>procedures also seen as “more effective” in Owusu-Ansah *et al.* (2002) study; overall mean response = 3.773

**Table III.**  
Audit procedures perceived as “moderately effective” in detecting fraud in the stock and warehousing cycle

issues (test pricing, checking additions, etc.). Our findings indicate that six of the procedures which were deemed moderately effective were similar to the New Zealand study.

#### *Less effective techniques*

Table IV shows that 26 (46 percent) of the audit procedures were below the mean of 3.773, indicating that these audit procedures are perceived by Barbados respondents to be “less effective” in detecting fraud in the stock and warehousing cycle. The lowest mean in this section was 2.969 for testing the number of hours needed to manufacture the product by comparing with engineering specifications. Based on the results of this study, less effective procedures are classified as those that indirectly collect audit evidence and hence should not be exclusively used in an audit, but as a complement to those seen as being “more effective” in detecting fraud. Less effective procedures included accounting for the direct materials, labour and overheads costs, comparing and evaluating current stock levels, sending confirmations to lenders, and recording client’s units for subsequent testing. In comparison, the Owusu-Ansah *et al.* (2002) study showed 15 (27 percent) of their 56 procedures were perceived as being “less effective.” However, our findings indicate that eleven of the procedures which were deemed less effective were similar to the New Zealand study, as shown in Table IV.

#### *Differences between auditors from large and small firms and fraud-detection procedures*

Table V presents the results of an independent samples *t*-test conducted to determine whether there were any differences in perceptions of the effectiveness of audit procedures utilized to detect fraud in the stock and warehousing cycle between auditors from large and small firms. Table V shows that there were only significant differences among auditors from large and small firms on only 11 of the 56 audit procedures. Auditors from large firms reported higher means for audit procedures such as identifying slow moving, obsolete or damage items, discussing with client management, performing cut off tests, and test pricing by tracing from unit costs vendor’s invoice to the perpetual stock records. However, this may be largely attributable to the fact that larger audit firms tend to be more structured compared to smaller firms, and hence, would tend to place greater emphasis on the above tests. Thus, this finding is not sufficiently conclusive to support previous research such as Moyes and Hasan (1996) and Owusu-Ansah *et al.* (2002) where it was found that firm size positively influenced the likelihood of detecting fraud in the stock and warehouse cycle.

#### *The level of audit experience, age and fraud-detection procedures*

Pearson’s bivariate correlation was performed to determine the relationship between level of audit experience and fraud detection (Table VI). The analysis indicated that there was no significant relationship between experience and perceived effectiveness ( $p > 0.05$ ). This suggests that the level of audit experience does not have a significant relationship on the perceived effectiveness of fraud detection audit procedures utilized. This finding was inconsistent with the work of Moyes and Hasan (1996) and Moyes (1996), who found that auditing experience of auditors was a significant factor in fraud detection. However, when we proxied age for experience, we found that age was positively and significantly related to perceived effectiveness ( $r = 0.459$ ,  $p > 0.001$ ),

Audit procedure (by the order of perceived effectiveness)	Mean	SD	t-value
1. Account for the direct material costs, direct labor costs and overheads costs involved in the valuation of manufactured stocks	3.766 <sup>a</sup>	0.584	-0.107
2. Compare and evaluate current stock levels with the previous year's	3.766	0.831	-0.075
3. Send confirmations to lenders for pertinent details about warehouse receipts pledged as collateral for liabilities	3.719 <sup>a</sup>	0.723	-0.605
4. Record client's counts for subsequent testing	3.719	0.723	-0.605
5. Review warehouse records for duplicate locations for the same items	3.625	0.882	-1.346
6. Trace shipment records to sales day book	3.609	0.884	-1.484
7. Examine stock descriptions on the tag and compare to the actual stock	3.594	0.729	-1.973
8. Review procedures for receiving, inspecting and storing and incoming items and for shipment out of the warehouse	3.594	0.729	-1.973
9. Test direct labor costs by comparing with labor payroll and union contracts	3.578 <sup>a</sup>	0.708	-2.205 *
10. Determine what cost (freight, storage, duties, etc.) should be included in valuation method and compare with the previous years'	3.547	0.815	-2.223 *
11. Obtain written confirmation of stocks in public warehouses	3.547	1.007	-1.800
12. Review and analyze variances to determine if stock valuation method is efficient	3.516	0.713	-2.894 *
13. Discuss with the client management the stock and warehouse cycle	3.484	0.816	-2.832 **
14. Review contracts with customers and suppliers and enquire of management about the possibility of the inclusion of consigned or other non-owned stock, or of owned that is not included	3.469	0.712	-3.423 **
15. Review policies regarding stock returns	3.469 <sup>a</sup>	0.712	-3.423 **
16. Compare extended stock value with the previous year's	3.438 <sup>a</sup>	0.889	-3.024 **
17. Evaluate whether the percentage of completion recorded on the tag for the work in progress is reasonable	3.422 <sup>a</sup>	0.638	-4.411 **
18. Compare unit costs of stock determined either with first in, first out (FIFO), last in, first out (LIFO) or average cost (AVCO) valuation methods with the previous year's	3.406 <sup>a</sup>	0.750	-3.916 **
19. Draw flow chart of internal control system and compare with written policies	3.375	0.807	-3.951 **
20. Compare the count of the larger items stated on the tags to the counts in prior year and the perpetual stock records	3.359 <sup>a</sup>	0.743	-4.461 **
21. Compare current manufacturing costs with the previous year's	3.328 <sup>a</sup>	0.619	-5.758 **
22. Observe that damaged and obsolete stocks are valued at net realizable value	3.281	0.951	-4.142 **
23. Verify pricing by locating the appropriate and sufficient invoices	3.219	0.845	-5.254 **
24. Compare the classification of raw materials, work in progress and finished goods with description on stock tags and auditors recorded test count	3.219	0.845	-5.254 **
25. In pricing stock, consider whether historical or replacement cost is lower	3.016 <sup>a</sup>	0.934	-6.489 **
26. Test number of hours needed to manufacture the product by comparing with engineering specifications	2.969 <sup>a</sup>	0.854	-7.538 **

Notes: \* $p > 0.05$ ; \*\* $p > 0.01$ ; <sup>a</sup>procedures also seen as "less effective" in Owusu-Ansah *et al.* (2002) study; overall mean response = 3.773

**Table IV.**  
Audit procedures perceived as "less effective" in detecting fraud in the stock and warehousing cycle

	Auditors from large firms ( <i>n</i> = 27) mean	Auditors from small firms ( <i>n</i> = 37) mean	<i>t</i> -value
1. Review stock count procedures: accounting for items in transit (in and out); comparison of counts with stock records; and reconciliation of differences between counts and stock records	3.700	4.110	- 3.661 **
2. Obtain written confirmation of stocks in public warehouses	3.150	3.840	- 2.577 *
3. Compare extended stock value with the previous year's	3.150	3.650	- 2.300 *
4. Identify slow-moving, obsolete or damage items within the stock	4.040 <sup>a</sup>	3.620	2.002 *
5. Discuss with the client management the stock and warehouse cycle	3.740	3.300	2.211 *
6. Determine if access to stock area is limited to only authorized personnel	4.330	3.950	2.012 **
7. Observe the physical count of stock at all locations	3.960	4.540	- 3.656 **
8. Compare unit costs of stock determined either with FIFO, LIFO or AVCO valuation methods with the previous year's	3.780	3.140	3.713 **
9. Observe that damaged and obsolete stocks are valued at net realizable value	3.560	3.080	2.019 *
10. Perform a purchases cut off test to ensure that goods in transit on FOB shipping point basis are recorded as purchased and included in stock	4.260	4.000	2.378 *
11. Test pricing by tracing from unit costs vendor's invoice to the perpetual stock records	4.040	3.680	2.109 *

**Notes:** \**p* > 0.05; \*\**p* > 0.01; <sup>a</sup>procedure also seen as "effective" in Owusu-Ansah *et al.* (2002) study

**Table V.**  
Differences in perceptions of audit procedures for fraud detection between auditors from large and small firms

**Table VI.**  
Pearson bivariate correlation of audit experience, age and perceived effectiveness of fraud detection

	Perceived effectiveness	Years of experience	Age
Perceived effectiveness	1		
Years of experience	- 0.071	1	
Age	0.459 *	0.013	1

**Note:** \**p* < 0.001

where older auditors ranked more audit procedures as being more effective than younger auditors. However, these mixed findings should be interpreted with caution.

#### *Perceived effectiveness and gender*

Table VII presents the statistically significant results of an independent sample *t*-test which was done to determine whether there were any differences in perceptions on the audit procedures utilized to detect fraud in the stock and warehousing cycle among males and females. According to the data, males consistently rated all 19 procedures higher than females. Thus, the results indicate that males perceive specific audit

	Male ( <i>n</i> = 26) mean	Female ( <i>n</i> = 38) mean	<i>t</i> -value
1. Review stock count procedures: accounting for items in transit (in and out); comparison of counts with stock records; and reconciliation of differences between counts and stock records	4.15	3.79	3.296 **
2. Draw flow chart of internal control system and compare with written policies	3.62	3.21	2.019 *
3. Obtain written confirmation of stocks in public warehouses	4.00	3.24	3.187 **
4. Review warehouse records for duplicate locations for the same items	3.88	3.45	1.993 *
5. Perform compilation tests to ensure the stock sheets total schedule agree with the physical stock count	4.42	3.95	3.446 **
6. Trace stock listed in the schedule to stock tags and the auditor's recorded counts for existence, description and quantity	4.58	4.11	2.435 *
7. Observe the physical count of stock at all locations	4.50	4.16	2.016 *
8. 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)	4.73	4.11	4.254 **
9. Compare the classification of raw materials, work in progress and finished goods with description on stock tags and auditors recorded test count	3.54	3.00	2.619 *
10. Review major adjustments for propriety	4.23	3.74	2.621 *
11. Review policies regarding stock returns	3.69	3.32	2.136 *
12. Trace shipment records to sales day book	3.88	3.42	2.116 *
13. Review and analyze variances to determine if stock valuation method is efficient	3.77	3.34	2.447 *
14. In pricing stock, consider whether historical or replacement cost is lower	3.35	2.79	2.431 *
15. Test number of hours needed to manufacture the product by comparing with engineering specifications	3.27	2.76	2.416 *
16. Examine financial statements for: for proper separate disclosure of raw materials, work in progress and finished goods; proper description of the stock costing method; of significant sales and purchase commitments; and proper description of pledged stock	4.46	4.05	2.464 *
17. Verify pricing by locating the appropriate and sufficient invoices	3.54	3.00	2.619 *
18. If a standard cost system is used, determine if the valuation method is efficient and useful by reviewing and analyzing the variances	4.19	3.71	2.489 *
19. Review contracts with customers and suppliers and enquire of management about the possibility of the inclusion of consigned or other non-owned stock, or of owned that is not included	3.69	3.32	2.136 *

Notes: \**p* > 0.05; \*\**p* > 0.01

**Table VII.**  
Differences in perceptions  
of audit procedures for  
fraud detection by gender

procedures to be more effective than females. This suggests that males tended to perceive a higher awareness of the audit procedures to be used. However, this finding was inconsistent with the work of Moyes (2007), who found that females rated the effectiveness of red flags higher than males. Moyes (2007) felt that the reasons for his surprising finding were that maybe males ignore the red flags rather than females being more ethically sensitive than males as stated in Sweeney (1995) and the possibility that females were more cautious.

### Conclusion

The main focus of this study was to test, within the Barbados context, the level of perceived effectiveness of 56 standard audit procedures used in the stock and warehousing cycle. The results have shown that there are perceived differences in the effectiveness of the standard audit procedures in the detection of fraud in the stock and warehousing cycle. More than half of the tested procedures were perceived to be “more effective” in fraud detection, while less than half were seen as “less effective.” In this study, a higher percentage of the procedures are being favored, when compared to the Owusu-Ansah *et al.* (2002) study. Those procedures shown as more effective were more field research or direct procedures in the collection of evidence, and those seen as less effective appeared to be those indirectly collecting evidence.

Thus, these results lend support for the use of rigorous and appropriate field techniques in the conduct of the audit engagement within Barbados. However, this finding may be linked to the fact that the Barbadian society is heavily influenced by the practices of its colonial ties with the UK and the need to follow international professional accounting standards (Alleyne and Howard, 2005). Additionally, Barbados can be considered as a rather conservative society which seeks to adopt the appropriate procedures that are considered likely to prevent scandals.

It was also seen that the sample in this study tended to report means above 3, compared to Owusu-Ansah *et al.* (2002), where the means fell below 3. The high means seem to suggest that auditors in Barbados are either more organized with their audits, more skeptical than those in New Zealand, or just have more confidence in the procedures that they adopt. Alternatively, the more favorable results may be directly attributable to the fact that global publicity on fraud and the repercussions of such fraud has made auditors more vigilant and meticulous over the last eight years since the Owusu-Ansah *et al.* (2002) study was conducted.

Our study also found that the size of the firm influenced the likelihood of detecting fraud in the stock and warehouse cycle. In particular, auditors from large firms perceived more effective fraud detection techniques than auditors from small firms. However, we found mixed findings with respect to level of experience and age as being influential in choosing fraud detection techniques. We also found that males rated the audit procedures consistently more effective in the detection of fraudulent activity than female auditors.

### Implications

This study provides additional evidence to the perceived effectiveness of fraud detection procedures in the stock and warehouse cycle. It builds on the work of Owusu-Ansah *et al.* (2002) and seeks to determine whether the perceptions of the effectiveness of the audit procedures are different. The study confirms that field techniques are the most appropriate procedures. This finding may inform audit practitioners that the audit program of all engagements involving stock should focus significantly on the use of effective field techniques to detect fraud and minimize audit risk. For example, it is quite possible that the use of effective field techniques could have uncovered phony inventory sheets at Crazy Eddie and fictitious inventory in transit at Miniscribe Corporation.

Since the Owusu-Ansah *et al.* (2002) study, global publicity on fraud has increased awareness, as well as introduced stricter regulations. This has made auditors more vigilant and circumspect in carrying out more substantial tests than they previously

would have, and in trying to ensure they thoroughly cover the necessary procedures in detecting fraud, especially in the stock and warehousing cycle. It is possible that the requirements of the Sarbanes-Oxley Act 2002 for all to be vigilant of fraud occurrence may have influenced the attitudes of auditors.

Although the audit procedures in this study are by no means an exhaustive list, they nonetheless represent the most widely used procedures that are discussed in most auditing textbooks. The experiences of auditors can also be a factor in the likelihood of detecting fraud in a stock and warehousing cycle. The average level of experience of the respondents in this survey (slightly lower than the New Zealand study) provides an adequate basis for the respondents' perceived expert judgments.

Auditors play a critical role in the detection of fraud not only in a stock and warehousing cycle, but also in other transaction cycles, protecting present and future stakeholders' interest, as well as their own interest. Auditors should always adopt high skepticism, thoroughness, vigilance and great awareness of red flags, as this would increase their ability to detect fraud. Auditors may need to become much more unpredictable. The findings of this study also show that auditors in both geographic locations (Barbados and New Zealand) seemed highly sensitive to fraud within the stock and warehouse cycle, and their techniques seemed quite effective in detecting fraud. This finding can provide some comfort to the audit profession and stakeholders. Thus, this research therefore expands the existing body of knowledge by adding additional evidence from a small developing country. The findings suggest that, regardless to country size and country development, auditors across the globe are, for the most part, quite vigilant in the execution of fraud detection techniques in the stock and warehouse cycle.

#### *Limitations and suggestions for future research*

Several limitations exist with this study. First, the small size of the sample limits the generalizability of the results to the wider population. Future research should seek to obtain larger samples. Second, the use of a self-administered survey questionnaire approach, by its nature, can be viewed as a major limitation, as it requires the sample to respond within specific parameters. Future research should incorporate a qualitative approach to obtain feelings and opinions and be able to probe deeper on issues in relation to the phenomenon under study. Another limitation may be the fact that the Owusu-Ansah *et al.* (2002) study is dated and audit practices may have changed since then. Finally, it should be noted that no test was done for non-response bias.

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