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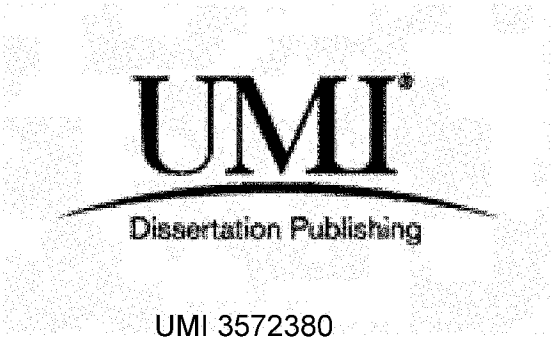

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Share Price Changes and Price/Earnings Ratios as Predictors of Fraud Prior to a Fraud Announcement

Dissertation

Submitted to Northcentral University

Graduate Faculty of the School of Business
in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

by

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June 2013

APPROVAL PAGE

Share Price Changes and Price/Earnings Ratios
As Predictors of Fraud Prior to a Fraud Announcement

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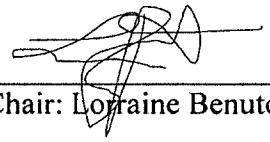

July 16, 2013

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7/17/2013

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Abstract

Rapidly changing economic environments led to new methods of committing financial fraud. While fraud indicators that require non-public corporate information were previously identified, research on fraud indicators using publicly available information (such as share price) was absent. According to the efficient market hypothesis, all information, both public and private, is included in share price. Thus, corporate share price should reflect fraud prior to a public fraud announcement. The purpose of this quantitative study was to test the efficient market hypothesis by determining the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was prosecuted for fraud. An ex post facto, secondary data analysis was conducted using the coefficient of variation and the price/earnings ratio as the predictor variables and fraud status as the criterion variable. Data was collected from 139 companies listed with the SEC and traded on an American stock exchange between 2000 and 2004. Companies convicted of fraud were matched with companies of a similar size within the same industry that were not convicted of fraud over the same time period. Data was entered into a logistic regression to determine whether changes in share price predicted whether or not the company was prosecuted for fraud. Results revealed a significant relationship between companies prosecuted for fraud and the coefficient of variation (Wald[1] = 4.6, p = .03). However, the relationship between the price/earnings ratio and companies prosecuted for fraud was insignificant (Wald[1] = 0.99, p = .32). Thus, the strong-form version of the efficient market hypothesis was supported only through the coefficient of variation. Results from this study support the use of quantitative measures that can help stakeholders detect fraud

early to minimize costs. Further research can build on these findings to create a more robust model with greater accuracy for detecting fraud.

Acknowledgements

I would like to thank my amazing husband for his ongoing support through my doctoral studies and dissertation. Thank you for making the dinners, scrubbing the bathrooms and playing taxi for our children on the evenings I had a deadline to meet or was too involved in my research to look up! Thanks also go to my amazing children: Allison, Katy, George Ryan and Anna Claire. You are the light of my life and the reason I made it through this journey! You were all supportive and loving, and even provided me with the comic relief I so desperately needed!

I also want to express my gratitude to my committee chair, Dr. Lorraine Benuto for all of her hard work and dedication. She was a teacher, mentor, and cheerleader. Thank you for your time and devotion to my research and for showing me how all of this was done! My sincere gratitude also goes to my committee expert, Dr. Kris Iyer for his advice and input throughout the final process and particularly for the research method and design.

I also want to thank my co-workers at Christian Brothers University who inspired me, prodded me and encouraged me throughout the process. Thank you for your help with some of the details and mostly for the support you gave me along with my work schedule flexibility! You are all so special to me and an inspiration to better myself to teach and support our amazing college students.

Thank you also to my parents for your on-going encouragement! You pushed me my entire life to be the best I could be. You never asked *if* I was going to college, but *where* I was going to graduate school! You always expected my best and taught me the importance of an education. Thank you for your endless love and support!

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Chapter 1: Introduction

At the end of the 20th century, some corporate representatives throughout all industries manipulated financial statements (Giroux, 2008). Several representatives of well-known companies, including Enron, WorldCom, and AIG were found guilty of financial scandals resulting from widespread collusion (Rockness & Rockness, 2005). Although the exact amount of loss from fraudulent activities is unknown, the average loss from fraudulent activity is estimated to be 5% of all corporate earnings (Association of Certified Fraud Examiners, 2010).

Financial fraud is incredibly problematic and has many negative consequences including that it negatively affects the share price of a company, creating losses for stockholders, employees, vendors, and customers, and results in an inability to increase corporate capital (Lord, 2010; Murphy & Tibbs, 2010; Rezaee & Riley, 2010). Unfortunately financial fraud goes largely undetected, as evidenced by the litigation against 101 companies conducted by the Securities and Exchange Commission (SEC) in the first quarter of 2012 (U.S. Securities and Exchange Commission, 2012). Fraud is primarily detected through the use of quantitative or qualitative indictors (Hogan, Rezzaee, Riley, & Velury, 2008).

Stakeholders use fraud indicators to make informed investment and business decisions (Kolman, 2007). Hegazy and Kassem (2010) found that fraud indicators were based on elements of fraudulent financial statements that increased the likelihood of detecting fraud. Members of the public could then use these indicators to monitor and identify potentially fraudulent situations early on to minimize personal financial damage. Public fraud detection can serve as a fraud deterrent and as an early detection mechanism.

Consumers need indicators to educate themselves about fraud and to perform further analyses of corporate information as a basis for making sound decisions (Hogan et al., 2010). In response to this, the relationship between share prices and accounting fraud was investigated in this study. Corporate share prices are publicly available and can be easily accessed and evaluated by consumers to identify potential problems when deciding on investments or employment. A discussion on the history of fraud and the measures that have been taken to detect fraud follows.

Background

Fraud has been in existence since the beginning of commerce, and as a response to fraud, laws were enacted in the Middle Ages through English common law (Buell, 2011). Increasing numbers of fraud attempts created more laws through the 17th and 18th centuries and eventually resulted in codified laws after the financial crisis of 1720 in England (Johnstone, 1998). As long as opportunities to profit exist, fraud is likely to continue (Rezaee & Riley, 2010).

Because fraud is prevalent, laws and oversight committees have been created in an attempt to curb fraudulent activity (Pinto, 2010) and after major fraudulent episodes, the U.S. Congress enacted laws to curb specific types of fraud (Buell, 2011). For example, during the Great Depression, the Securities Act of 1933 was created, followed by the Security and Exchange Act of 1934, which established the Security and Exchange Commission (SEC) to oversee financial business matters (Pinto, 2010). Several decades later (after foreign bribes became a problem in the 1970s), the Foreign Corrupt Practices Act was established, and after major financial statement frauds were detected in early 2000, the Sarbanes-Oxley Act of 2002 was created (Bagnoli & Watts, 2007). Despite

this legislation, fraud is still prevalent worldwide (Pinto, 2010) and was the main focus of this study in the context of white-collar crime.

White-collar crime encompasses a range of criminal acts including fraud committed by members of the business community (Johnstone, 1998). White-collar crime involves a transition from fraudulent actions damaging a few select individuals to actions damaging a broad range of stakeholders (Agnew, Piquero, & Cullen, 2009). It includes theft by deception and misconduct, negligence, and questionable business practices (Johnstone, 1998). In response to the presence of white-collar crime (and the observed increase), the forensic accounting field has both come into existence as its own branch of accounting and has grown substantially (Agnew et al., 2009).

In fact, the forensic accounting field has undergone rapid growth since 1990 in response to highly visible accounting scandals involving firms such as WorldCom, AIG, and Bernie Madoff Investments (Shinde, Poznic, & Buehne, 2010). Within the accounting and auditing profession, professionals have developed guidelines and procedures for identifying and detecting fraud, including audit frameworks, fraud checklists, hiring criteria, risk assessments, antifraud control activities, and a well-controlled business environment (Brazel, Jones, & Zimbelman, 2009; Erickson, Mayhew, & Felix, 2000; Hegazy & Kassem, 2010; Kolman, 2007; Lundstrom, 2009). When major fraudulent events occur, representatives of the SEC and other governmental bodies establish laws and regulations (Lenard, Meonske, & Alam, 2009). Law enforcement agencies and organizations are therefore invested in strategies to reduce fraud and prosecute offenders (Buell, 2011). However, these strategies need to be evaluated continually for effectiveness and opportunities for improvement (Lenard et al., 2009).

In addition to law enforcement agencies and organizations, financial professionals also continually develop techniques to identify fraud and potentially fraudulent situations (Kolman, 2007). Fraud indictors include financial ratios and trends, management characteristics, industry changes and characteristics, and linguistic variables (Lundstrom, 2009). Representatives of government agencies and oversight boards rely on unusual changes in annual reports and earnings restatements, and inside information from whistleblowers to identify fraudulent situations (Bowen, Call, & Rajgopal, 2010). While investors, customers, and vendors (in contrast) have only limited information available to detect fraud, stakeholders could also use additional external measures of fraud to make informed decisions regarding a company (Agnew et al., 2009). Thus, it was necessary to research and identify additional fraud indicators particularly in light of the high costs associated with fraud and the general absence of fraud indicators available to the general public.

Statement of the Problem

The average annual corporate fraud cost is $2.9 trillion, representing 5% of corporate annual revenues and a median loss of $4 million from financial-statement fraud (Association of Certified Fraud Examiners, 2010). These financial costs are manifested in several ways. Specifically, financial-statement fraud causes a loss of earnings, negatively affects corporate share price, and results in difficulties in increasing corporate capital (Pinto, 2010). Methods to identify fraud during the course of an audit include financial account relationships and differences in horizontal and vertical analyses (Hogan et al., 2008; Kolman, 2007). Despite that other means for detecting fraud exist (such as those discussed above) financial statement fraud still goes largely undetected (Seo, Choi,

Choi, Lee, & Lee, 2009). In fact, the Securities and Exchange Commission (U.S. Securities and Exchange Commission, 2012) litigated 101 companies during the first quarter of 2012 for fraudulent activities. As indicated above, detecting fraud is a problem and detection of fraud is necessary.

Purpose of the Study

The efficient market hypothesis (EMH) can help predict fraud as the focus of the efficient market hypothesis is on current share price, which reflects both public and private corporate information (Ball, 2009). In turn, the stock price of a given company should reflect the fraud prior to a public announcement. To provide stakeholders with possible external indicators of fraud, it was useful to confirm or disconfirm the efficient market hypothesis by examining whether changes in share prices prior to a fraud announcement predicted financial fraud for a broader range of companies listed with the SEC. Thus, the purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The study was conducted using data from 139 companies listed with the SEC and traded on an American stock exchange, 70 of which were prosecuted for, between 2000 and 2004. This provided a 98.81% accuracy based on a medium effect size of $f = 0.15$ and an alpha significance level of 0.05. These numbers were established using the G*Power analysis tool (Faul, Erdfelder, Buchner, & Lang, 2009).

Theoretical Framework

The efficient market hypothesis was used as the theoretical framework for this study. Eugene Fama developed the efficient market hypothesis in the 1960s to explain share prices in efficient public markets (Fama, Jensen, Fisher, & Roll, 1969). The efficient market hypothesis is based on the idea that the secondary market for a company's shares is an efficient market. Market efficiency requires that (a) securities are traded without transaction costs, (b) all available corporate information is public, and (c) all parties agree on the implications of available pricing information (Glen & Hornung, 2005). Because a perfectly efficient market does not exist, the efficient market hypothesis provides measures of the effects of these market factors (Ball, 2009).

Ullah and Giles (2011) identified three distinct forms of the efficient market hypothesis. The weak-form is based on an assumption that all information regarding previous price movements is reflected in the current price. The semi-strong form is based on the assumption that current market prices reflect all public information available to price setters. The strong-form of the efficient market hypothesis is based on the assumption that current market prices reflect all public and private information. After 1940, when the U.S. Great Depression ended, government regulation of the share market imposed new requirements and specifications that did not fit all industries and situations. As a result, the efficient market hypothesis did not hold when stakeholders were not informed of all of the necessary information needed to make decisions and when stakeholders were not aware of unavailable but relevant information, as was the case when fraud occurred (Dunbar & Heller, 2006).

Because of recent scandals involving insider trading, the strong-form version of the efficient market hypothesis has not been well substantiated. In these cases, insiders could profit from knowledge that was not public information (Ilg, 2010). In addition, after the sharp market decline of 1987, factors affecting share prices, outside of market information, were identified and share prices were therefore shown not to reflect true fundamental values (Boettke, 2010). Furthermore, according to the strong-form version of the efficient market hypothesis, abnormal returns are not expected to occur: however, contrary to this idea, small firms often earn abnormally high returns (Ullah & Giles, 2011). The differences in returns based on company size are included in factor models because sufficient statistical evidence exists that, even when controlling for other factors, small firms outperform larger firms (Glen & Hornung, 2005). The rationale for this persistent source of excess returns is that since small firms are inherently riskier than large firms, investors must be compensated for this additional risk. While risk for the sake of risk is not a source of excess returns, additional risk that is taken on as a result of capital investment should be compensated, which can result in persistent excess returns for small firms (Gould, 2009).

Supporters of the efficient market hypothesis argue that mutual funds do not exceed market prices. According to this argument, abnormally high returns and abnormal relationships between past and current performance are impossible (Milburn, 2008). Researchers who have focused on the ability to predict share prices have not found a share prediction method (Boettke, 2010; Milburn, 2008). As a result, past performance is still not proven to predict current performance.

The use of the efficient market hypothesis as the theoretical framework for this study was justified as a result of its prominence in finance (Ullah & Giles, 2011). Ullah and Giles (2011) also noted that the findings regarding tests of the efficient market hypothesis have been inconclusive. Despite this, the rational decision-making framework upon which it rests is often taken for granted to at least a small degree by economists and mathematical financial theorists (Ball, 2009).

The efficient market hypothesis is an application of rational expectations to securities prices in the public markets and is controversial among economists (Ullah & Giles, 2011). Some researchers have found that insider traders could profit from non-public information (Ilg, 2010). In addition to research identifying day-of-the-week trading differences in stock markets, researchers have demonstrated the possibility of abnormal share returns, thereby showing evidence to the contrary of the efficient market hypothesis (Muhammad & Rahman, 2010). Other studies have shown that some classes of shares are predictable (Ilg, 2010). Financial statement fraud helps explain some of the abnormal share price fluctuations and is therefore a factor in the debate surrounding the efficient market hypothesis (Ullah & Giles, 2011).

In addition to the alteration of financial statements to perpetrate fraud, other theories use the efficient market hypothesis as a means of explaining why shareholder losses exist. For example, the fraud-on-the-market theory stems from the efficient market hypothesis and uses the hypothesis as the foundation for proving shareholder losses in court (Korsmo, 2011). This theory is closely related to the efficient market hypothesis because it requires proof of an efficient market (Dunbar & Heller, 2006). For example, earnings management practices include increased investment levels that in turn distort

economic resources (Kedia & Philippon, 2009). This is then reflected in share price and can mislead investors (Berkman, Zou, & Geng, 2009). In an efficient market, all earnings management practices and fraud should be reflected in the share price (Fama et al., 1969). Thus, if the share price reflects public and private information as stated in the efficient market hypothesis, then the fraud-on-the-market theory can be upheld in court cases.

Because evidence regarding the use of the efficient market hypothesis as a means for explaining and predicting fraud is inconclusive, this proposed study helped to fill that evidentiary void. A study of share prices prior to the announcement of fraud was useful to test the efficient market hypothesis. Thus, if fraud was reflected in the share price, the share price would be shown to be reliable, and the strong-form efficient market hypothesis would be confirmed. If fraud was not reflected in the share price, the evidence can be used to dispute the efficient market hypothesis.

Research Questions

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The development of methods to identify and prevent fraud depends on an understanding of the factors that contribute to fraud (Simon, 2012). These methods included identifying warning factors that point to a need to review a company further to determine if fraud is present (Kranacher, Riley, & Wells, 2011). In

addition, external stakeholders can use indicators to make better decisions and to provide information to create an awareness of potential problems (Agnew et al., 2009). Stakeholders can thereby contribute to fraud prevention by discouraging fraud (Omar & Abu Baker, 2012). According to the efficient market hypothesis, share prices are based on the most recent public and nonpublic information (Dunbar & Heller, 2006; Glen & Hornung, 2005). The following research questions and hypotheses guided the proposed study:

Q1. What is the relationship (if any) between the coefficient of variation of share price (calculated as the standard deviation of the share price of the company divided by the company's average share price) computed over 1 year and the probability of a company being prosecuted for fraud?

Q2. What is the relationship (if any) between the P/E ratio computed over 1 year and the probability that a company was prosecuted for fraud?

Hypotheses

$H1_0$. There is no statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H1_a$. There is a statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_0$. There is no statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_a$. There is a statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

Nature of the Study

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. A secondary data analysis that included data pulled from reputable data warehouses was conducted on two predictor variables with respect to the criterion variable. Instruments were not used in this study as this study was an ex post facto, secondary data analysis and no new data was collected. Instead, an Excel spreadsheet was created and all data was entered into the spreadsheet directly from the COMPUSTAT database. The criterion variable for this study was the prosecution for fraud (dichotomous). The predictor variables were the P/E ratio (continuous) and the coefficient of variation of share price (continuous). Two predictor variables were evaluated to determine if the variables could differentiate between companies prosecuted and not prosecuted for fraud: the coefficient of variation and the P/E ratio. The coefficient of variation of share price was calculated as the standard deviation of the share price of the company divided by the company's average share price (Scholz, 2007). The outcome variable was defined as fraud status, a dichotomous variable with possible values of 0 (*not prosecuted for fraud*) and 1 (*prosecuted for fraud*). A multiple logistic

regression controlled for company size was used to determine whether a predictive relationship existed between the predictor variables and the probability of whether a company was prosecuted for fraud over the selected time period.

Data was obtained from the COMPUSTAT database and was analyzed using an ex post facto secondary data analysis to determine whether the coefficient of variation of share price and P/E ratio could predict the dichotomous criterion variable of whether a company was subsequently prosecuted for corporate fraud. Two predictor variables were used to differentiate between companies with and without prosecuted fraud: (a) the coefficient of variation (defined in Chapter 3), and (b) the P/E ratio (continuous). In addition, because of large differences in company size, control variables for the change in income and the sales growth rate were used in the regression. The controlled logic regression enabled the identification of patterns of association based on the predictor variables used to predict the criterion variable.

Data was obtained for companies on file with the U.S. SEC for 2000 through 2004, which served as the study population. This time period was selected because numerous cases of fraud were discovered during and after the economic period ending in 2001, in which many corporate share prices were considerably higher than the intrinsic value. For this period, 70 financial fraud and insider trading cases were identified (see Appendix). An equal number of companies not prosecuted for fraud were selected with the exception of one company (Manahagar Tel Nigam) which was excluded from the analysis due to missing data for a total of 69 companies, resulting in a total sample size of 139, giving a 98.81% power to the study according to the G*Power software program (Faul et al., 2009). For companies prosecuted for fraud, data was examined for a period

of one year prior to the fraud announcement. Each company prosecuted for fraud was matched with one company not prosecuted for fraud. The match was based on size and Standard Industrial Classification (SIC) System code. Prices during the same time period were examined for each set of two companies. The outcome of the study provided a means of testing the efficient market hypothesis and confirmed whether stock prices reflect private corporate information. The data for this study was input into SPSS (version 18) statistical software. The logistic regression was computed to classify the companies in terms of fraud status, based on the two predictor variables

Significance of the Study

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The global cost of fraud is $2.9 trillion annually and this amount represents 5% of annual corporate revenues (Association of Certified Fraud Examiners, 2010). This high level of fraud is believed to be a result of ineffective legislation and a lack of easily identifiable fraud indicators (Lenard et al., 2009). Thus, given the high costs associated with fraud, identifying models that accurately predict fraud are important. A discussion on internal corporate factors, nonfinancial measures, timeliness of public information, and existing indicators further demonstrated the need for a fraud indicator stemming from timely, public data.

Researchers have focused primarily on internal corporate factors to identify fraud (Kaiser & Hogan, 2010; Kranacher et al., 2011; Maguire, 2010). Fraud indicators based on internal corporate information include efficiency and productivity statistics (Brazel et al., 2009; Kranacher et al., 2011), performance guidelines linked to management incentives (Anderson &Tirrell, 2004), and personal characteristics of the executive management team (Kaiser & Hogan, 2010; Kranacher et al., 2011). Annual reports contain information used by stakeholders to perform financial analysis as a way of determining financial irregularities and corporate efficiency. Representatives of public companies are required to include, in financial statements, earnings per share of stock and ratios of earnings to fixed charges for debt (Cohen, Polk, & Voulteenaho, 2009). The inclusion of these data is seen as a means of ensuring accurate reporting of key financial metrics.

Companies are not required to include nonfinancial measures in the annual report (Cohen et al., 2009). Nonfinancial measures are included only on a voluntary basis, and the quality of the volunteered measures is not consistent or reliable (Bescos, Cauvin, Decock-Good, & Westlund, 2007). As stakeholders do not have access to internal corporate information, some opportunities for fraud analysis do not exist for external parties. As a result, stakeholders cannot evaluate management ethics or the corporate culture, both of which are factors in fraud detection, except through external earnings releases and news articles. Voluntary disclosures of management performance information vary based on the implications of the disclosures regarding perceived corporate performance (Bagnoli & Watts, 2007).

Another concern with information in annual reports is the lack of timely data for analysis. A time lag exists between the end of a reporting period and earnings releases. Currently, SEC registrants are allowed 90 days after the fiscal year end to file the report: accelerated registrants are allowed 60 or 75 days, depending on the timing of the fiscal year end (Notification of inability to timely file all or any required portion of a form 10-K, 20-F, 11-K, N-SAR, N-CSR, 10-Q, or 10-D, 1934). As a result, data are not available to stakeholders for the close of each fiscal period until the following quarter.

Stakeholders use fraud indicators to make informed decisions (Hegazy & Kassem, 2010; Kolman, 2007; Skousen & Twedt, 2010). A number of fraud indicators must exist to increase the likelihood of detecting and preventing fraudulent financial statements. Members of the public then use these indicators to monitor and identify potentially fraudulent situations early, as a way of minimizing damage to the company and the stakeholders. In addition to education on fraud, consumers need indicators to trigger further analysis of corporate information to make sound decisions. Identifying a timely external indicator of fraud based on public information related to share price and P/E ratios can help stockholders make informed decisions and identify problems before fraud results in financial damage to a company.

Definition of Key Terms

10K. A 10K is a comprehensive annual report about the operations and financial health of a company, as required by the SEC. This report is intended to provide information to all stakeholders about the financial situation and performance of the company over the previous year. The 10K is produced within 90 days of the fiscal year end of a company (Lehavy, Fing, & Merkley, 2011).

Average return. Average return is defined as the average share return of a company over a given period (Scholz, 2007). The purpose of the average return is to ascertain the performance of a company in comparison to the market.

Audit. An audit is a set of tests conducted to yield evidence as part of an investigation to ensure financial statements are fairly presented. Tests include mechanical accuracy, analytical tests, documentation, confirmations, observations, physical examinations, and inquiries (Hogan et al., 2008).

Coefficient of variation. The coefficient of variation will be defined as the standard deviation of the company's share price divided by the average share price (Scholtz, 2007).

Earnings management. Earnings management is the manipulation of company income through the use of direct or indirect accounting methods to meet investor expectations. Earnings management is considered misleading and is often considered fraud (Gavious, 2009).

Efficient market hypothesis. The efficient market hypothesis is a theory according to which shares are always in equilibrium, and an investor cannot consistently realize gains beyond market levels. The theory supports the idea that financial markets are efficient in disseminating information. Three versions of the efficient market hypothesis exist: a weak form, a semi-strong form, and a strong form. According to the weak form, all past corporate information is reflected in the current market price. According to the semi-strong form, current market prices reflect all publicly available information for the company from the past and present. According to the strong-form,

the market price of the share reflects all information, both public and private (Glen & Hornung, 2005).

Expected return. The expected return is the mean of a probability distribution of possible future share returns. A market model is used to identify the expected share return based on historical data (Barakat & Terry, 2010).

Financial-statement fraud. Financial-statement fraud is a form of fraud occurring when financial statements are prepared with misstatements intended to manipulate, falsify, or alter accounting records to obtain the appearance of favorable performance. Financial-statement fraud includes inappropriate loans, insider trading, favoritism, executive financial incentives or compensation, and employee fraud (Albrecht, Albrecht, Albrecht, & Zimbelman, 2012).

Fraud. Fraud is an act performed to deprive individuals of assets illegally. Fraud includes cheating individuals using unfair methods to deceive and involves a false representation of something material. Fraud is believed and acted on by the perpetrator in such a way as to cause damage to the victim (Albrecht et al., 2012).

Fraud indicator. A fraud indicator is a symptom or characteristic indicating that fraud may be present (Hegazy & Kassem, 2010).

Fraud-on-the-market theory. The fraud-on-the-market theory is a theory according to which the price of a company share is determined by all available material information. As a result, fraudulent or misleading information will skew the share price and defraud the share investors regardless of whether these investors rely on the misstatements or fraudulent information (Dunbar & Heller, 2006).

Fraud triangle. The fraud triangle represents three elements present in almost all fraud cases: pressure, opportunity, and rationalization. These three elements are used to predict the likelihood of fraud or to identify potential fraudsters. Pressure is related to unmet financial needs of an employee. Opportunity refers to the ability to commit the fraud because of a lack of controls or because of access to sensitive financial information. Rationalization is an attitude leading to the creation of a moral excuse for committing the fraud (Hopwood, Leiner, & Young, 2012).

Great Depression. The Great Depression was a period of world-wide economic, political, and social turmoil from 1929 – 1939 that followed World War I. During this time, the New York Stock Exchange collapsed from a fall in share prices, and the decline in the value of assets resulted in the failure of 11,000 banks (Graham, Hazarika, & Narasimhan, 2011).

Income smoothing. Income smoothing is a method used in earnings management designed to keep income figures stable by adding or removing cash from different reserve accounts. Corporate representatives use income smoothing to match predetermined income targets and to eliminate exceptionally good or bad earnings. Excessive income smoothing is considered fraudulent (Martinez & Castro, 2011).

Information leak. An information leak is the dissemination of information or signals of nonpublic information to outsiders. Information leakage in companies generally occurs through whistle blowers and insider trading (Rosen, 2007).

Insider trading. Insider trading is the trading of corporate securities based on information not publicly known, to take advantage of this publicly unknown information (Prentice & Donelson, 2010).

Logistic regression. Logistic regression is a form of statistical regression that uses the odds of an event occurring and the logarithmic transformations as the unit. Logistic regression is used when independent, or predictor, variables are used in the analysis with a dependent, or criterion, variable that is categorical (Vogt, 2007).

National Association of Securities Dealers Automated Quotations (NASDAQ). NASDAQ is a dealer market for publicly traded securities based on a computerized network with a decentralized opening market call. The NASDAQ is the largest electronic equity security trading market in the United States (Fuller, Van Ness, & Van Ness, 2010).

New York Stock Exchange (NYSE). The NYSE is an auction market for publicly traded securities with a centralized opening market call. The NYSE is the largest stock exchange based on market capitalization (Barclay, Jones, & Hendershott, 2008).

North American Industry Classification System (NAICS). The NAICS is a system developed by representatives of the U.S. government, the Canadian government, and the Mexican government to classify companies by industry. This coding system is based on the use of a six-digit number, with the first two digits representing the major industry sector of a specific company, the third digit representing the industry subsector, and the fourth digit representing the industry group. The first five digits are uniform across the United States, Canada, and Mexico (U.S. Census Bureau, 2012).

Predictor variables. A predictor variable is an independent variable that is used to predict the value of another variable. Predictor variables are often used in statistical regression models (Tonidandel & LeBreton, 2011).

Price/earnings (P/E) ratio. The P/E ratio is a ratio used to determine the value of a company. This ratio is a division of the market value per share by the corporate earnings per share. A high ratio suggests that investors anticipate future earnings growth (Ikoku & Hosseini, 2010).

Sarbanes-Oxley Act (SOX). The SOX is a federal law, enacted in 2002, imposing new duties and penalties on public companies and their officers, directors, attorneys, analysts, and auditors to deter corporate fraud. The SOX was designed with the expectation of improving public confidence in U.S. capital markets. The SOX mandated the creation of the Public Company Accounting Oversight Board (PCAOB) to oversee public company audits, set standards, and investigate problems. The SOX also required auditor independence, corporate responsibility for fair reporting, and enhanced financial disclosures. In addition, the SOX defined analyst conflicts of interest, increased the budget and authority of the SEC, mandated the initiation of new accounting studies, imposed criminal penalties on violators of the SOX, required the chief executive officer of a company to sign the corporate tax return, and established prison terms for tampering with records of a criminal proceeding (Albrecht et al., 2012).

Secondary data analysis. Secondary data analysis evaluates data that already exists. Analyzing pre-existing data is used to investigate new questions or to verify previously collected data (Andrews, Higgins, Andrews, & Lalor, 2012)

Share market. The share market, also referred to as the stock market, is a public institution for the trading of corporate shares at an agreed upon price (Harrison & Moore, 2012).

Share price fluctuation. A share price fluctuation is a daily change in a corporate share price brought about by market forces. These forces are often the result of supply and demand for the security. The share price fluctuation also can be defined as the percentage change in the price, calculated by subtracting the share price of the previous day from the price of the current day and dividing that amount by the share price of the previous day (Louhichi, 2008).

Standard Industrial Classification (SIC). The SIC is system for classifying businesses by industry using a four digit code. The SIC code was developed in 1937 by the United States government and is also used by other foreign governments. The SIC has been superseded by the NAICS six digit code released in 1997, but the SIC code is still used by many government agencies including the Securities and Exchange Commission (U.S. Census Bureau, 2012).

Whistleblower. A whistleblower is an individual who reports potentially fraudulent activity to an unrelated third party (Negative Consequences, 2011).

Summary

This chapter included an introduction to the proposed quantitative research study, and a number of key points were made that provide a justification for this study. Financial scandals at the end of the 20th century have resulted in new legislation to discourage fraud and in new techniques to identify indicators of fraud (Rockness & Rockness, 2005). Known indicators of corporate fraud were found to include internal corporate measures (Kranacher et al., 2011; Lundstrom, 2009), management characteristics (Maguire, 2010), and quantitative measures (Kolman, 2007). While some known indicators of fraud exist, there still remains a large amount of fraud that occurs

despite the use of those indicators. As a result, the identification of an additional indicator, based on public information and using the efficient market hypothesis, would help auditors and stakeholders make informed decisions and identify potential fraud early to minimize financial damage.

Thus, the investigation utilized two predictor variables and two control variables to determine whether publicly available share prices can predict fraud. The theoretical framework that guided this study was the efficient market hypothesis, which states that all information available to price setters is taken into account in the share price. Thus, the predictor variables for this study were the coefficient of variation of share price (continuous) and the price-to-earnings ratio (continuous) while the criterion variable for this study was the prosecution for fraud (dichotomous). In the next chapter a detailed review of the relevant literature is provided and in Chapter 3 the methodology of the proposed research study is discussed.

Chapter 2: Literature Review

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The growth in fraud cases, the ineffective mechanisms that currently exist to combat fraud and the deleterious consequences of fraud bring forth the need for further research on the issue. In fact, fraud cases cost as high as $900 billion annually, including the costs to carry out legal action, substantial reduction in productivity levels, increased unemployment levels as well as business process interruption because of investigation (Kranacher et al., 2011).

In this chapter, the literature relevant to evaluating financial statement fraud was reviewed and organized as follows. First, why and how fraud takes place was discussed. Topics such as information leaking, in the form of insider trading and the problem associated with whistle blowing were covered. Second, the factors contributing to fraud, the preventive measures taken against fraud, and fraud indicators were discussed. Third, discussions on the efficient market hypothesis and the fraud-on-the-market theory were included. Lastly, a pilot study that described the relationship of share price to fraud relating to Enron and WorldCom was presented. Covering these topics provided a basis for identifying the companies included in the present study and the time frames used in the present study (which focuses on share prices and fraud). Within this review of the

literature, models to predict fraudulent conditions and to identify fraudulent situations were identified.

Documentation

Several databases were searched to identify the sources included within this literature review. For example, Academic Search Premier, Emerald Plus, Ibis World, Informit Business, Science Direct, ProQuest, Sage Journals Online, and SCORPUS were searched to identify literature relevant to the topic at hand. Keywords such as *fraud, financial statement fraud, efficient market hypothesis, Enron, WorldCom* and others were used to locate the literature presented in Chapter 2.

Fraud

Fraud is loosely defined as an act of deceit for the purpose of personal gain (Albrecht et al., 2012). Individuals having roles within the fraud literature include auditors, whistleblowers, company management, prosecutors, and the police. There are also different types of fraud including financial-statement fraud, occupational fraud, and other non-financial types of fraud. A discussion on the various types of fraud follows and information about key individuals within the fraud literature is provided. Finally, laws related to fraud are also reviewed.

Organizations in the United States lost 7% of their annual revenues to fraudulent activity. Measured against the 2008 Gross Domestic Product, this translates to fraud losses amounting to approximately $994 billion (Association of Certified Fraud Examiners, 2008). Financial-statement fraud is a form of fraud that occurs when financial statements are prepared with misstatements intended to manipulate, falsify, or alter accounting records to obtain the appearance of favorable performance (Association

of Certified Fraud Examiners, 2010). Financial-statement fraud is not the same as occupational fraud, for which the purpose is to benefit an individual. Individuals commit financial-statement fraud to mislead third parties, including lenders, regulators, owners, and investors (Albrecht et al., 2012).

With the increase in fraud cases, comes a parallel decrease in the distinction between the role of auditors and forensic accountants on how to deal with fraud. This distinction was discussed by Hogan et al. (2008). Auditors are experts in perusing financial statements and provide assurance services; they need to have passed the licensure exams for public accountants in order to gain the designation of *Certified Public Accountant* (CPA). In relation to fraud detection, auditors have more of a preemptive role since they have to identify miscalculations or errors in the financial statements before hand, and in the process, catch fraud before it can take place (Hogan et al., 2008).

According to Arens and Elder (2006), as well as the work of Coenen (2006), while there is a higher demand for auditors to have the ability to detect risks and frauds in their financial statements, they may not be prepared to do this effectively. Compared to forensic accountants, auditors have different skill sets and this might be reflected in the degree of professional skepticism they employ toward their investigation of the financial statements. Instances exist where supporting documents and explanations may not be sufficient to an investigator, and this lack of ability to detect fraud with documentation is more prevalent among forensic accountants than with auditors (DiGabriele, 2009). In addition to auditors, local prosecutors are also actors in fraud investigations.

Local prosecutors collaborate with local police and state regulatory agencies on joint investigations of corporate crime (Hogan et al., 2008). Fighting economic crime encourages prosecutors to develop the technical expertise to combat white-collar crime (Benson, Cullen, & Maakestad, 1990). The Public Company Accounting Oversight Board (PCAOB) is the self regulatory system in place that regulates the accounting profession in the United States by making sure that audited financial statements put forth by the professionals involved are reliable (Doty, 2012). The PCAOB is supported financially by the dues paid by the SEC Practice Section (SECPS) members, which makes it autonomous and independent. This independence allows the PCAOB to form its own rules and procedures as well as to form its board members and staff. The board members come from different areas of expertise (including business and professional experts) while some are regulatory and legislative experts (Boster, 2007).

In a panel, the Public Oversight Board expressed concern that auditors are left behind in this rapidly changing environment (Beasley, Carcello, Hermanson, & Neal, 2009). According to the panel, the auditing profession needs to step up in addressing the issue of fraud within financial reporting. In addition, auditors need to establish a means to have zero defects on audit engagements, and they should strive to eliminate audit failures (Boster, 2007). As such, there should be stronger and more defined audit standards to enhance the work of auditors in investigating and detecting fraud. There is a need for a "forensic-type" fieldwork phase, which is comprised of substantive tests with fraud detection capabilities (Doty, 2012). Auditors at all levels should be trained for the type of work they are required to undertake and especially for fraud detection of the

various types of fraud (e.g., insider trading, financial-statement fraud, embezzlement, and internal theft).

Insider Trading

One of the most common types of fraud is insider trading. Insider trading involves the use of nonpublic information to profit in capital markets (Klumpp, 2007). Insider trading is one of the suspected methods of information leakage that can cause share prices to drop prior to the announcement of fraud. Insider trading occurs in two ways. Individuals may use public information to identify share pricing errors made by investors, or private information about future cash flows may be used to capitalize on anticipated share prices (Kallunki, Nilsson, & Peltoniemi, 2009). The first method uses public information and is not considered fraud. The second situation, however, involves fraud.

The idea behind insider trading is that employees within a corporation who have access to daily company information are able to predict changes in performance based on daily operations (Elliott, Aby, & Mondal, 2010). Elliot et al. (2010) conducted a study and investigated insider trading. The study was conducted using 150 stocks listed in *Vickers Weekly Insider* between 1997 and 1998 as the most actively traded by insiders. The study results from the time series analysis indicated that less than 25% of stocks declined in response to insider buying and less than half of the stocks increased after insider selling. The authors found that the employees internal to a company who have access to corporate financial information can therefore capitalize on the company changes that affect share prices but investors relying on insider trading magazines will not capitalize on predicted stock price changes. This study laid a good foundation for

research in insider trading, but should be expanded to include additional stocks on different stock exchanges. In addition, time series analyses often identify the noise created by confounding variables rather than the trends (Vogt, 2007). A great deal of insider buying of company shares can suggest that insiders believe that the share is undervalued and that the price should increase in the future. Similarly, insider selling indicates an insider viewpoint of lower future earning power that negatively affects share price. Capitalizing on inside information can be done using multiple methods.

Klumpp (2007) discussed three methods for insiders to profit from a company. First, the trader can profit from speculation prior to any announcement. Second, the trader can speculate based on an announcement already made, a process termed *post-announcement speculation*. Finally, the trader can profit from speculating both before and after the announcement. As a result, the trader must determine if the inside information is helpful and whether to speculate on the information.

Some researchers (e.g., Kallunki et al., 2009) have reported that corporate insiders generally receive abnormal returns on their speculation. The assumption, of course, is that the insiders are aware of the nonpublic information and capitalize on such information. In addition to research findings, many publicized occurrences of insider trading have demonstrated the ability of insiders to profit from nonpublic information. For example, Anderson (2005) reported that representatives of the SEC found that ImClone executives, their family members, and their friends, including Martha Stewart and family members of the executives, sold large quantities of shares prior to the announcement from the Federal Drug Administration that Erbutix, a new drug produced

by ImClone, did not receive approval. As a result, the share price of ImClone fell sharply.

Research on insider trading does not appear to support the efficient market hypothesis in that difficulties arise in trying to profit from insider information. Although opportunities do exist for investors to obtain above normal profit from insider trading, additional research is needed in which the research is performed using statistical methods to account for noise and confounding variables. In addition, insider trading research should be conducted in different markets to identify the efficiency levels of different markets.

Most financial-statement fraud is committed by executives not likely to leak the fraud or to allow other individuals to be in a position to notice the fraud (Giroux, 2008). As a result, much fraud remains undetected. However, whistleblowers play an important role in fraud detection. Whistleblowers are individuals who identify and report fraudulent or potentially fraudulent situations (Rosen, 2007).

Rapp (2011) summarized statistics on whistleblowers. He indicated that whistleblowers might be employees, individuals outside of a company who interact with the company, or representatives of independent bodies such as auditing firms and the SEC. In addition to Rapp (2011), Giroux (2008) also indicated that employee (whistleblower) tips are responsible for 14% of fraud detection in most industries, but the number rises to 41% in industries subject to the federal False Claims Act. Thus, employees are needed to report suspected fraud. Employee tips are often the major cause of information leaks prior to fraud announcements and certain laws exist related to whistleblowers to ensure their protection.

For example, Under the Dodd-Frank Act, individuals who voluntarily provide original information on security fraud violations are entitled to amounts between 10% and 30% of the SEC sanctioned action (Negative Consequences, 2011). Under §922 of the Dodd-Frank Act, whistleblowers are disqualified from collecting funds if the whistleblower is convicted based on action from the tip, if the individual does not use a required form, or if the information in the tip is acquired from information obtained in an SEC audit (Sinzdak, 2008; Uliassi, 2011). Regulation 21F requires cash payments to whistleblowers meeting specific criteria (McKinney, Holtan, & Sohn, 2011). This regulation was designed to reward the whistleblower and to provide compensation, not only to encourage the reporting of fraud but to also counteract any potential retaliation by the company or other companies in the industry.

Although company representatives are prohibited from retaliating against whistleblowers, between 82% and 90% of whistleblowers are fired, quit, or are demoted (Negative Consequences, 2011). Thus, a deterrent to reporting fraud exists, possibly lowering the number of fraud tips. Regardless, whistleblowers contribute to information leaks that occur prior to the announcement of fraud.

As illustrated above, employee tips are the most common form of initial fraud detection because employees are usually aware of the fraud before other internal and external stakeholders are aware of the fraud (Kaplan, Pope, & Samuels, 2011). One problem with employee knowledge of fraud is that employee intentions to report fraud are often stronger than the occurrence of reporting the fraud. Researchers have evaluated intentions to report fraud to an auditor to study the willingness of employees to report the information. Kaplan et al. (2011) sent a survey to 207 MBA students and analyzed the

results using an ANOVA. The researchers found that the intentions of employees to report fraudulent information to an inquiring auditor (mean average of 5.65) are stronger than to a non-inquiring auditor (mean average of 5.07: Kaplan et al., 2011). Thus, active audits in the company provide opportunities for employees to report problems or suspected fraud. Although this study identified the willingness of individuals to report fraud, many problems exist within this research study. First, the study was conducted only with MBA students. Even though many MBA students are employed, the study was conducted in an educational setting that often includes courses in ethics and an expectation to answer in the manner assumed correct. Secondly, the study only covered one educational demographic. Additional studies should be conducted using employees at all levels of a company and in a corporate rather than an educational setting. To identify suspicious activity or transactions as fraud, it is important that employees have an understanding of fraud indicators.

Fraud Indicators

Fraud has been found to occur most often during periods of great economic expansion and is typically not discovered until the economy begins to contract (Gray, Frieder, & Clark, 2007). Gray et al. (2007) surveyed past historical economic changes to draw the conclusion that historically, fraud is identified after economic expansions referred to as "bubbles". The extended economic expansion ending in 2001 resulted in stakeholder expectations of higher growth from companies, and as a result, managers manipulated earnings to match these expectations (Ball, 2009). Indicators of fraud during economic prosperity are often difficult to identify.

Fraud is often identified via fraud indicators such as leadership integrity, economic risk factors, and company risk factors (Anderson & Tirrell, 2004; Roxas, 2011; Stewart, 2006). Lack of leadership integrity and managerial competence often results in fraudulent managerial misconduct (Gottschalk & Solli-Sæther, 2011; Kaiser & Hogan, 2010). Data on managerial misconduct provides company stakeholders with information for evaluating the potential for fraud and in developing methods to reduce the likelihood of fraud in the hiring process. Most financial-reporting fraud has been found to originate from a lack of integrity by the chief executive officer (Anderson & Tirrell, 2004). The majority of these findings, however, are based on subjective surveys, and results cannot be applied to a population. For example, Gottschalk and Solli-Sæther (2011) used a web-based survey in their empirical research to explore leadership integrity in Norway. Anderson and Tirrell (2004) also suggested based on their case study research that good management and leadership could help in preventing cases of fraud. Rather than case studies and surveys, researchers should focus additional research efforts on evaluating executive's who have already committed fraud to identify common characteristics that can be directly linked to the fraud. Specifically, areas to focus on in evaluating fraud indicators include leadership integrity and motivation, economic contributors, and company fraud factors.

Leadership integrity and motivation. Researchers have found that a lack of leadership integrity results in managerial misconduct (Kaiser & Hogan, 2010). Management competence is also a well-researched factor in detecting and preventing fraud (Gottschalk & Solli-Sæther, 2011). Such research provides companies and their stakeholders with the ability to evaluate the potential for fraud and to develop methods to

reduce the likelihood of fraud. Anderson and Tirrell (2004) evaluated executive motivations to commit fraud through case studies. Through their research, they discovered that the majority of financial reporting fraud originated in the office of the Chief Executive Officer. The above research illustrated that integrity is a major factor in fraud although the majority of the studies only use surveys. These surveys are somewhat subjective and cannot always be applied to a population, and identifying integrity problems is not always as easy as using a survey. As a result, further fraud predictors must be obtained to help improve the means by which fraud can be identified.

Another area of study includes a focus on financial incentives for corporate leadership. Johnson, Ryan, and Tian (2009) found that fraud was more prevalent in firms where management incentives came from unrestricted stockholdings. In this study, the researchers selected firms that were the subject of the SEC Accounting and Auditing Enforcement Releases from 1991 – 2005. Based on the sample, unrestricted stock holdings were positively related to the likelihood of fraud (p =.03). This study added to the research regarding the pressure that exists to commit fraud. Thus, the desire of management to improve their own personal financial position carried a greater weight in the decision to manipulate corporate earnings. As a result, this study should be used as a foundation for companies to identify incentives that do not result in the pressure to commit fraud. Additional research should be conducted using other executive incentives to identify additional pressures on executive management

Employee factors have also been studied; for example Wells and Gill (2007) used a questionnaire to assess corporate fraud based on employee factors. This questionnaire included an evaluation of the responsibility level of key employees, outside employee

business interests, employee background checks, education on anti-fraud programs, ethics violations, and job and assignment rotation. All of these factors aim to create a corporate culture not conducive to fraud. Furthermore, Fernandes and Guedes (2010) divided management behavior and motivations to commit fraud between incentive effects and need effects. Results from their study indicated that these two effects play distinct roles in the incidence of accounting fraud and the economic conditions that exist during the fraudulent acts. In the research study, fraud was found to occur with both a positive and significant incentive effect ($\beta_1 = 185.4$, $t = 2.75$) and a negative and significant need effect ($\beta_2 = -92.9$, $t = -2.26$). This study confirmed the study results of Johnson et al. (2009) and added to the research by identifying two different categories of executive incentives. Both studies identified pressures to commit fraud to help companies set incentives that do not encourage fraud. Both studies used robust statistical methods to test existing incentives. In sum, economic conditions influence the incentive effects and management characteristics contribute to the need effects.

In fact, financial incentives are not considered an absolute indicator of fraud—the incentives only provide the pressure to commit fraud, and from the research conducted by Anderson and Tirell (2004) it can be inferred that executives committing fraud may have to be evaluated for integrity. Unfortunately, it may not be possible to evaluate every company based on executive incentives and as a result, further fraud indicators must be developed. An additional problem with the research summarized above is that incentives are not always public information. Stock-based compensation must be reported in the annual report; however, other incentives are not (Rosen, 2007). In addition, an annual

report only gives stakeholders a one-time per year view into the company's compensation structure.

With regard to executive management, additional factors have been identified to predict fraud. For example, motivations to commit fraud when combined with weak executive management character result in higher fraud risk. Specifically, Kim, Park, and Wier (2012) identified a link between corporate ethical values and the perception of management earnings. They found through multiple regression and logistic regression that socially responsible firms were less likely to manage earnings through accruals ($p < .01$), were less likely to participate in income-increasing accruals ($p = .03$), and were less likely to participate in income-decreasing accruals ($p < .01$). In addition, internal corporate and personal pressures on executive management in non-corporate socially responsible firms created the pressure for executive management to seek fraud opportunities. Thus, assessing the integrity of management is important in reducing fraud risk. As a result, management integrity could be posited as a key factor in reducing fraud risk. This study also contributed to the fraud research regarding pressure for executive management. The statistical methods used were robust and noise was accounted for. However, the ability for companies or stakeholders to use this will be difficult because an understanding of accounting terminology and procedures is necessary to understand the method used to manipulate accruals.

Evaluating and rating management integrity is key to minimizing fraud committed by executive management. Kaiser and Hogan (2010) conducted a study to identify competency ratings to measure management integrity, and they suggested incorporating management integrity factors into the hiring process to help companies reduce fraud risk

factors. In their empirical study using a competency based integrity scale for rating managers, the researchers found that the integrity rating was the least likely to predict performance. In fact, the integrity score was .90 standard deviations higher than the other four rating factors with a paired $t_{(671)} = 22.88, p < .001$. As a result of this study, fraud factors are important to recognize because they can alert stakeholders of potential fraud, but the fraud factors should be identified in the hiring process rather than through standard performance ratings. The problem with this research is that competency ratings and scales are often difficult to interpret and are subjective in nature. Therefore, different individuals using the same scale can often come up with different results. Subjective methods are somewhat unreliable in attempting to identify individuals with fraudulent tendencies. In addition, great candidates could be forgone because of one individual's analysis of the rating scale. It is apparent that competency factors increase the potential of fraud. However, because of the subjective nature of these factors, additional indicators such as share price changes must be evaluated to help stakeholders determine if the factors have a relationship to indicators to further evaluate a company. However, it is important to first review other contributors to fraud.

Economic contributors to fraud. Outside of management characteristics, fraud also occurs more often under changing business and economic conditions. Stewart (2006) identified factors associated with economic growth as a potential opportunity for fraud. These factors included business globalization, changing government regulations, market complexity, and increased computer automation. These economic factors provide both incentives and opportunities from changing economic conditions. In addition, Kedia and Philippon (2009) demonstrated through research that firms with low-productivity hire

and invest in too many resources to compete with high-productivity firms. This results in a distortion of economic resources and encourages earnings management practices. In their research, Kedia and Philippon developed a model to evaluate 845 public companies between 1997 and 2002 to determine whether or not growth rates in assets, employees, capital, productivity and market values are higher for firms using earnings management practices. The results of the research indicated that at the $p < .01$ level, all growth rates with the exception of productivity are higher for firms that must restate earnings due to earnings management practices. Furthermore, corporate governance has an effect on the decision to commit fraud (Berkman et al., 2009). This decision to commit fraud is often related to meeting analyst forecasts, the need to obtain external financing, or poor relationships between a parent and subsidiary company. This research provided a method for analysts and stakeholders to identify potentially fraudulent situations early. However, to use this research effectively, stakeholders must evaluate the entire industry of the company to determine the average and to define what growth rates are considered higher than the average. This research study provided an excellent quantitative method using public information to identify potentially fraudulent situations. However, this study only covers the fraudulent situations associated with earnings management. Additional fraud indicators are needed for other forms of fraud.

Other researchers have focused on fraud in relation to economic cycles. Gray et al. (2007) evaluated economic cycles and the occurrence of fraud. These researchers also discovered that fraud often occurred during periods of great economic expansion and was not discovered until the economy began a downward trend. Ball (2009) also emphasized that the extended economic boom that ended in 2001 created higher growth expectations

from companies that pressured management to manipulate earnings to match performance expectations. These expectations resulted in the manipulation of financial statements to obtain positive investor reactions (Louichi, 2008). However, after the manipulation, the share price often returned to the equilibrium market price.

The existence of economic bubbles, where the intrinsic value of the share is lower than the share price, is also an economic indicator of fraud. Gray et al. (2007) surveyed historical economic bubbles across all continents. From the survey and evaluation of these economic bubbles, Gray et al. concluded that a clear relationship existed between the presence of economic opportunities and the existence of financial scandals. The researchers further concluded that the opportunities and pressures created from economic bubbles resulted in temptations toward greed and speculation, which were exploited and resulted in wide spread financial fraud. Furthermore, researchers have identified causal economic factors that related to share price changes in foreign markets (Büyüksalvarci &Abdioğlu, 2010). The causal relationship identified in the research indicated that share price could be a leading indicator of the economic growth. Specifically, the causal study results indicated that the Istanbul Stock Exchange is a leading indicator of many economic variables including the exchange rate and the industrial productivity index at the 5% significance level, and gold, the money supply, and inflation at the 10% significance level. As a result, this research study demonstrates that share price is affected by economic changes. However, internal corporate factors should also be evaluated.

Internal corporate economic factors also contribute to fraud. Maguire (2010) determined that companies accused of financial fraud are "weak-form inefficient both

before and after the public announcement of fraud" (p. 99). The weak-form inefficient hypothesis indicates that the current share price of a company reflects only the historic share prices of that company. Another theory identifies that companies in emerging markets are more prone to fraud (Skousen & Twedt, 2009). This theory, based on the Fraud Score Model, identifies that countries and industries are more prone to fraud in emerging markets.

The above research studies confirm that economic conditions have some affects on fraud. In fact, the studies reviewed above indicate that most fraud occurs during economic expansion. More specifically, the researchers have highlighted the circumstances that created more pressure and opportunity to commit fraud during periods of economic expansion. In fraud studies, the evaluation of economic conditions is imperative. In addition, researchers need to focus on times of economic prosperity. Indicators of fraud during economic prosperity are more difficult to identify (Ball, 2009; Gray et al., 2007). As a result, economic fluctuations must be isolated from share price to evaluate the changes in share price to determine any relationship to fraud. While the above discussion was focused on economic contributors to fraud, other factors exist that should be considered in a discussion on fraud including fraud factors within companies.

Company fraud factors. Most fraud research focuses on fraud assessment based on internal company factors. Brazel et al. (2009) performed research that identified non-financial fraud measures as accurate indicators of risk. These indicators are more difficult to manipulate than financial indicators and as a result provide a better analysis of potentially fraudulent situations. Based on the research that developed a variable to measure the difference between the percent change of revenue and the percent change of

the nonfinancial measures, Brazel et al. found that the mean difference for fraudulent firms is .3 and the mean difference for non-fraud firms is .11, thus resulting in a significant finding ($p < .05$) that nonfinancial measures do provide an indication of fraud. Brazel et al. also identified that non-financial measures were relevant as indicators of fraud. The problem with this study is the use of nonfinancial measures. Nonfinancial measures are often inconsistent and unreliable. Because standards do not exist regarding non-financial measures, companies often create the measures specific to that one company. Thus, the measures are difficult to compare and are often not consistent. Furthermore, nonfinancial measures are often not available to stakeholders external to a company and cannot be used for analysis.

Other researchers have focused on financial measures. For example, Smith, Omar, Idris, and Baharuddin (2005) found that operating and financial stability is most important in judging indicators of fraud through financial indicators based on their research study using surveys of auditors in Malaysia. One potential indicator through which fraud can be perpetrated is earnings management.

Earnings management is the manipulation of earnings to meet debt obligations, executive bonuses, or share analyst expectations (Gavious, 2009). Earnings management practices, which occur internally in a company, occur to meet analyst expectations and can lead to fraudulent financial data. Earnings management practices can occur within generally accepted accounting principles (GAAP) or in violation of GAAP. The former Chairman of the SEC, Arthur Levitt, believes both types of earnings management practices have similar effects on securities prices (Roxas, 2011).

It is important to know what fraud indicators exist, and employees and stakeholders should recognize fraud indicators so that fraud can be detected early. However, many indicators are not easy to identify, or are also indicators of other problems. As a result, it is important to develop fraud detection techniques so that some procedures and indicators are included as part of normal company operations.

Fraud Detection Techniques

Using known fraud indicators, researchers have found ways to incorporate the indicators into specific fraud programs and techniques to identify fraud early and to prevent fraud before it occurs. Roxas (2011) conducted a research study that compared the effectiveness of two analytical procedures to detect earnings manipulation. This research involved using analytical techniques to examine the usefulness of detecting financial statement fraud through earnings manipulations. The 652 companies identified in the study participated in earnings management practices as identified by the SEC's Accounting and Auditing Enforcement Releases from December 13, 1999 to June 17, 2008. Financial statement information was used for each company two years prior to the violation and two years after the violation. Roxas used Beneish's probit model and Benford's law to identify earnings management practices and identified 62% of companies in the year of manipulation and an additional 15% in the year before manipulation through Beneish's probit model. However Roxas, did not effectively detect earnings manipulation when using Benford's law. Additionally, an evaluation of earnings manipulators using these methods did not identify all of the earnings management practices but did identify companies requiring further investigation.

The use of analysis tools to detect financial fraud from earnings manipulations when combined with company specific information helps stakeholders identify situations that can lead to or detect fraud (Gavious, 2009). Fraud indicators are important not only in raising the suspicion of fraud but also in helping to prevent fraud by eliminating the manipulation of financial and nonfinancial measures (Gottschalk & Solli-Sæther, 2011; Hogan et al., 2008). As a result, further research is necessary to identify additional indicators that can be easily used by stakeholders to identify potentially fraudulent situations. Fraud detection could be improved if available public measures could be used as indicators.

Researchers have focused minimally on fraud indicators despite that early identification of fraud can limit damages to stakeholders. Nonetheless, some limited research has been conducted. For example, Miller (2006) explored early identification of accounting fraud by evaluating various news releases to determine if potential fraud the press had identified fraud prior to the fraud becoming public knowledge. Although only 29% of fraud was identified early through the press, this is a significant finding as a fraud indicator. Kolman (2007) developed a fraud risk questionnaire for internal auditors to use to detect and prevent fraud. This questionnaire covers the components of the fraud triangle. Another indicator was identified in a study by Maguire (2010), who found that weak-form inefficient firms had higher occurrences of fraud suggesting that it is worth looking closer at a company to determine if fraud exists. Maguire's research was performed using the Augmented Dickey-Fuller test for weak-form market efficiency and the Box Ljung Chi Squire test for white noise. This research study consisted of 42 firms meeting the study requirements between 1998 and 2002 and resulted in a z-

statistic = –2.06, which is significant at the 5% level. This research study used robust statistical techniques and accounted for unrelated external noise. As a result, the research provided support for higher occurrences of fraud in weak-form inefficient firms. This analysis can be used by stakeholders to identify firms needing further review for potential fraud. Additionally, a fraud identifier in the form of a fraud score analysis was developed by Skousen and Twedt (2009). In their study, Skousen and Twedt developed a tool to identify companies that exhibit a higher potential to commit fraud.

Stakeholders use indicators to identify potential corporate fraud and to perform analyses to minimize losses resulting from fraud (Hegazy & Kassem, 2010). Financial data signaling fraud includes accrued revenues, unusual changes in discounts, variations in sales volumes, large or complex transactions occurring at year-end, and understatement of allowance accounts (Hopwood et al., 2012). Häckner and Nilsson (2008) evaluated the effectiveness of horizontal and vertical control structures in preventing fraud. They used case studies to determine that horizontal control structures afford more fraud protection. Vertical control systems give management a level of control that contributes to fraud through the use of pressure and bribes on subordinates. An additional indicator of fraud is earnings management practices that may be reflected in the share price (Gavious, 2009).

Other indicators involve procedures and policies within a company. Poor disclosure quality is one such indicator related to higher capital costs resulting in investor anticipation of future corporate earnings (Hussainey & Mouselli, 2010). This anticipation affects the corporate share price. Finally, share price fluctuations have been found to fluctuate directly with earnings announcements (Louhichi, 2008). Louhichi

(2008) evaluated 117 overnight announcements using an intraday event-study methodology to evaluate abnormal returns. Results from this research study indicated that positive abnormal returns returned to normal within 15 minutes and negative abnormal returns dissipated within 30 minutes. Further research is needed to determine the relationship of press-related share prices with fraud. This study should be repeated using different companies of different sizes and on different exchanges. In addition, this study should be performed in markets of different efficiencies to further identify the relationship of earnings announcements and share price fluctuations. Another preventive measure is to eliminate opportunities to commit fraud. The fraud triangle dictates that for fraud to exist there must also be pressure, opportunity, and justification to commit fraud (Kranacher et al., 2011). Opportunity can be eliminated through a review of financial statement fraud risk factors. These risk factors include industry characteristics, the complexity of corporate transactions, and effective system and manual controls (Hogan et al., 2008).

Other fraud indicators include specific indicators that identify a need for further exploration of the possibility of fraud within a company. Smith et al. (2005) surveyed audit firms to identify indicators of fraudulent findings. These indicators included operating and financial stability and management characteristics. Stewart (2006) identified economic factors that signal the potential to commit fraud. These indicators are important in alerting stakeholders to perform additional analysis to minimize losses resulting from fraud. Researchers have found support for the idea that indicators are helpful in detecting fraud (Hegazy & Kassem, 2010). These researchers evaluated financial data to identify fraud signals that include accrued revenues, unusual changes in

discounts, variations in sales volumes, large or complex transactions occurring at year's end, and understating allowance accounts. This research provides knowledgeable parties with fraud signals. However, a thorough financial knowledge is required to evaluate the companies and identify potentially fraudulent situations. For example, an external auditor could potentially evaluate these changes and variations, but without a focused financial education, stakeholders will not be able to identify these signals. Changes in these accounts signal potential problems in financial statements.

Researchers have developed a framework using a series of known indicators to identify risk factors in potentially fraudulent environments. Specifically, Murcia and Borba (2007) identified 266 indicators from previous research and narrowed the number of indicators used in the framework to 45 indicators identified by at least two sources. These 45 indicators were further divided into six categories including internal structure, industry, management, financial situation, accounting reports, and auditing services. Murcia and Borba concluded that inadequate internal controls are not the only elements responsible for fraud, and that indicators in all six categories are necessary to identify a potentially fraudulent environment. The framework developed from the study was used to identify risk factors found in fraudulent environments. Although this framework proves useful, only individuals with access to internal corporate information can identify the elements that contribute to fraud. Further research should be performed to identify if each category can independently identify a potentially fraudulent environment and how reliable the category is at identifying the potential fraud. Additionally, the categories should be identified based on which stakeholders can access the information necessary to identify the potential fraud.

Hegazy and Kassem (2010) also performed a study on fraud indicators in an attempt to determine if external auditors found the indicators listed in SAS 99 useful in detecting fraud. Data for the study was collected using a questionnaire that was pretested by a pilot study and distributed to 100 external auditors working in different audit firms in Egypt. Both Hegazy and Kassem, and Murcia and Borba (2007) identified accepted fraud indicators and developed questionnaires for external auditors to rank the indicators to identify which are helpful or important. They concluded that the list of indicators in the questionnaire were helpful in detecting fraudulent financial reporting. Although Hegazy and Kassem identified the opinions of experts in the usefulness of indicators, the ability to generalize the research is limited. In addition, this study only reviewed indicators identified in SAS 99 and was not inclusive of additional indicators.

An additional indicator of fraud is the fluctuation in the corporate share price. Share prices reflect the market news and company performance. Gavious (2009) studied analyst reactions to earnings management. Earnings management practices are detected by analysts and as a result are reflected in share price. Gavious evaluated 502 recommendations from 367 target prices for 73 Israeli firms listed on the NYSE. The regression coefficient measuring the affect of analyst's recommendations for earnings management was -8.54 ($p = .0007$), indicating that analysts do not modify recommendations based on earnings management announcements. Hussainey and Mouselli (2010) also studied analyst reactions to companies through examining the quality of corporate disclosures. They found that poor disclosure quality is related to higher capital costs, allowing investors to anticipate future corporate earnings, which, in turn, affect the corporate share price. Here, Hussainey and Musselli conducted a multiple

regression model that resulted in the earnings change coefficient of 1.53 that is significant (p = .0001) and the future earnings coefficient of .48 as significant (p =.0001). As a result, reliable future stock returns were found to be associated with a high disclosure quality. Finally, Louhichi (2008) performed a study that found share prices fluctuated directly with earnings announcements. In addition, positive news resulted in share prices returning to equilibrium prices faster than negative news. The above research studies all use reliable statistical techniques to evaluate the relationship between share prices and corporate decision making for earnings. These studies support the efficient market hypothesis in that analysts rely on share price rather than corporate disclosure quality, and that the disclosure quality directly affects share price. The statistical techniques used are reliable and contribute to the body of knowledge supporting the efficient market hypothesis.

In an effort to link some indicators specifically to fraud, Kumar and Langberg (2009) conducted a research study to create a model that identified corporate indicators of fraud. In their research they used the role of capital markets in the occurrence of corporate fraud and the role that capital markets played in recent corporate scandals. The model developed used three different time periods and considered different management control perspectives and incentive mechanisms. In addition, different benchmarks were used for the model including complete information and information-constrained outcomes. The results of this study included a new theory where "corporate fraud is accompanied by low-return states and under-investment in high-return states" (Kumar & Langberg, 2009, p. 161). The model predicted that easy access to external capital or financing increased the likelihood that fraud would occur. Additionally, the framework

suggested that technological innovations are linked to a higher likelihood of corporate fraud. Finally, weak corporate policies and a lack of commitment to those policies contribute to the likelihood of fraud. Thus, Kumar and Langberg (2009) determined that a model can be used to identify indicators of fraud at the corporate level. The problem with this research is the subjectivity of the model that was developed. The model did cover different time periods and considered different situations. Thus, the model is robust. However, without consistency in creating and analyzing the model, the model will be unreliable. In addition, the information required for the model is not publicly available and thus cannot be used by many stakeholders. As a result, further fraud indicators should be developed that are publicly available.

One researched fraud indicator is the level of deferred tax. Ettredge, Sun, Lee, and Anandarajan (2008) published a paper to provide evidence that SFAS 19 tax data proves useful in distinguishing between companies that engage in overstatement fraud. These researchers evaluated deferred tax expense variables and book income minus taxes as they related to known fraudulent companies. The need to focus on tax fraud is confirmed by researchers as the method to manipulate financial statements through deferred tax (resulting in fraud) is often overlooked by auditors and forensic accountants (DeZoort, Harrison, & Schnee, 2012; Klimaitiene & Grundiene, 2010). In light of this, Ettredge and colleagues looked at 65 firms with positive pretax income selected from the SEC Accounting and Auditing Enforcement Releases. Control companies were matched based on asset size and SIC code. These researchers found that a strong association (using a logistic regression) exists between fraudulent companies and a high deferred tax income ($p = .06$ for fraud firms with a higher deferred tax expense and $p = .05$ for the

fraud firms in the top 20th percentile of their industry for deferred tax expense). Specifically, a relationship between management tax reporting behavior and the existence of fraud within that company was identified. The researchers did not, however, attempt to predict fraud using this finding. Further research should be conducted to identify whether or not the higher deferred tax expense indicator can predict fraud. One weakness with this type of indicator is the lag between the end of a period and the issuance of financial reports that provide the amount of deferred tax expense. Thus, even if this indicator could predict fraud, the delay of up to 90 days eliminates the benefits of identifying fraud early. Likewise, Klimaitiene and Grundiene (2010) did not predict tax fraud, but rather identified methods to prevent or detect fraud using budgets – it is important to note that the sample was selected from a report of known fraudulent companies, and the results may not be representative of all companies. Further research should be performed to identify whether or not the fraud indicators identified by the researchers above can predict fraud to help in minimizing losses to stakeholders. Ettredge et al. used publicly available information that could be used by stakeholders if deferred tax is identified to predict fraud in their research study.

Researchers agree that fraud indicators are important not only in raising the suspicion of fraud, but also in helping prevent fraud by eliminating the manipulation of financial and non-financial measures (Bowen et al., 2010; Gottschalk & Solli-Sæther, 2011; Hogan et al., 2008). Fraud indicators are important to research that focuses on eliminating financial statement fraud. As a result, further research is necessary to identify additional indicators easily used by stakeholders to identify potentially fraudulent situations. Researchers need to focus on fraud indicators that are easy for the investing

public to use. Public information is often the only data individuals can use in decision-making. Thus, fraud models and indicators should be expanded to include measures available to the public.

Even with publicly available fraud detection techniques, the most cost effective way to fight fraud is to prevent fraud. Because of the excessive cost of detecting fraud and implementing controls to eliminate a particular fraud from reoccurrence, it is important to implement measures to prevent fraud. Fraud prevention measures include analytical processes, carefully defined incentive programs, and a review of external information.

Fraud Prevention Measures

Research on company fraud factors confirms that measures can be used to identify potential fraud. For example, both financial and non-financial ratios and factors can identify potentially fraudulent situations (Gottschalk & Solli-Sæther, 2011). The limitation to this type of study is the lack of available public information on companies. Many stakeholders are restricted to annual reports and share prices. As a result, non-financial measures are not available as fraud detectors to many stakeholders. Likewise, financial measures are limited only to public information. Thus, these studies need to be combined with financial information available to the investing public to identify indicators of fraud in addition to measures to prevent fraud.

One of the most important preventative measures of fraud is to reduce incentives for committing fraud. Incentives to commit fraud include pressure to meet analyst forecasts, compensation and incentive structures, the need for external financing, and compensation for poor corporate performance (Hogan et al., 2008). Pay incentives, as

well as work and family pressures, also encourage fraud (Gottschalk & Solli-Sæther, 2011). Each of these factors encourages corporate officers to manipulate earnings to meet analyst and corporate expectations.

The early identification of fraud can limit damages to stakeholders. Press releases and news articles indicated that 29% of fraud occurrences are identified in the press prior to the time the fraud becomes public knowledge (Miller, 2006). Fraud risk questionnaires based on the fraud triangle have been developed for internal auditors to use to detect and prevent fraud (Kolman, 2007). These questionnaires were developed for the purpose of fraud prevention. The problem with both of these research studies is the lack of ability for stakeholders to use this information to predict potentially fraudulent situations. Press releases did not predict fraud the majority of the time in Miller's (2006) study and internal questionnaires in Kolman's (2007) study are not available publicly.

Bota-Avram (2008) explored fraud prevention from the viewpoint of the internal audit function. Although deterring fraud is management's responsibility, internal audit is responsible for examining and evaluating the adequacy of internal controls and management actions. Furthermore, according to Coram, Ferguson, and Moroney (2008), the internal audit function adds value to an organization through internal controls and the monitoring of self-reported fraud. Bota-Avram reviewed the adequacy of internal audit functions residing within the organization, functions outsourced, and functions consisting of a combination of internal and outsourced functions. According to Bota-Avram, "internal audit can be defined as an independent, objective, assurance and consulting activity designed to add value and improve an organization's operations" (p. 183). As a result, internal auditors must have sufficient knowledge to identify fraud indicators.

Bota-Avram (2008) gathered all existing theory, concepts, ideas, and opinions of subject area experts and analyzed and identified a connection between fraud and the internal audit function. She concluded that the internal audit function was vital in preventing and detecting fraud even though only 7% of fraud incidents are found through internal audit. It is important to note that advantages exist with both internal and outsourced audits. Internally located audit departments offer a greater advantage in understanding the corporate culture and company specific information necessary to identify risks. Likewise, other researchers found that the internal audit function, when not outsourced, served as a control function and a fraud management element (Coram et al., 2008; Floştoiu, 2012). However, Bota-Avram (2008) noted that an outsourced audit department had the advantage of assuring better independence. As a result, an audit department is an outstanding preventive measure for fraud and companies can benefit from a combination of internal and external sourcing of the audit function. Although internal and external audit departments are required and are important in a company, the effectiveness of the audit unit and the frequency of the audits cannot be verified by the public. Thus, the existence alone of an auditor cannot be used as the only deterrent to fraud. Without full disclosure of the entire audit, only executive management and the audit committee can verify the effectiveness of the audits. As a result, further research should be conducted to identify fraud deterrents.

Omar and Abu Baker (2012) agree with Bota-Avram (2008) in that an internal audit function is crucial in fraud deterrence and limiting fraud exposure. Omar and Abu Baker (2012) emphasized that internal audit should also foster control consciousness in the organization, ensuring that realistic organizational goals and objectives are set.

Additionally, internal audit ensures that written policies and procedures, authorizations, and communication channels exist. Omar and Abu Baker (2012) also noted that an independent audit committee must exist with a strong chairman and a board that fosters open and candid communication.

Fraud prevention research focuses on reducing the pressure and opportunity identified in the fraud triangle. Researchers agree that controls, corporate structure, and compensation packages can be designed to minimize or prevent fraud (Gottschalk & Solli-Sæther, 2011; Häckner & Nilsson, 2008; Hegazy & Kassem, 2010; Miller, 2006; Skousen & Twedt, 2010; Wells & Gill, 2007). However, researchers do not address other factors that can be used by stakeholders as preventative measures. The identification of preventative measures such as ratios and share prices can also give the investing public a method to identify fraud. Once fraud identification or predictive measures become accepted practices, such measures will serve as a deterrent to fraud. The greater the ability to recognize fraudulent actions, the less likely executives will be to commit fraud (Hegazy & Kassem, 2010).

Currently, very few researchers focus on developing and using fraud indicators as tools for stakeholders to prevent fraud. Additional indicators of fraud must be explored, and the focus should be on developing and identifying tools easy for stakeholders to use and understand. This is important because fraud rates will likely decrease as the ability to detect fraud improves.

Nonetheless, at least some researchers have focused on identifying why fraud occurs, recognizing how to identify it, and establishing methods to prevent it (Gottschalk & Solli-Sæther, 2011; Häckner & Nilsson, 2008). It is important that well-established

indicators of fraud be identified so that stakeholders can be alerted of potential fraudulent situations before the financial losses associated with fraud result in damage to the company and all stakeholders. One specific indicator of fraud is share price. Share prices fluctuate based on information that is available publicly. The efficient market hypothesis can be used to identify information that causes share prices to change. By evaluating the efficient market hypothesis, a better understanding of how share prices react to fraud announcements and information leaks can be developed.

Efficient Market Hypothesis

The efficient market hypothesis is a cornerstone of modern financial theory, and this hypothesis postulates that investors cannot obtain yields higher than the market yield: this is primarily because market efficiency results in share prices incorporating all relevant information in published documents such as financial reports, press releases, and corporate communications (Ross, Westerfield, & Jordan, 2010). According to the efficient market hypothesis, share returns do not conform to patterns; thus, future prices cannot be predicted through a study of past prices (technical analysis), or through an analysis of corporate financial information (Rao, 2007). This theory also states that share prices are maintained through the buying and selling of shares in the open market (Glen & Hornung, 2005). Here, the trading volume serves as a natural share valuation control.

Much debate exists surrounding the efficient market hypothesis. Believers of this theory argue that trends cannot be predicted through technical analysis since the technical analysis would already be known and incorporated into the stock price. Academics also agree with the efficient market hypothesis because it is based on a large body of evidence (Dunbar & Heller, 2006). Dissenters of the efficient market hypothesis point to events,

such as the 2008 stock market crash, as evidence that share prices can deviate from their fair value. Another example is found with fraudulent financial statements that present misleading information to stakeholders causing unreliable decisions (Kumar & Langberg, 2009).

Similarly, Fox (2009) claimed that financial markets are useful and the financial instruments in that market convey information; however, without analysts and stakeholders exercising judgment and applying research, markets will not reflect accurate securities prices. Garcia, Gaytan, and Wolfskill (2012) also disagreed with the efficient market hypothesis based on results from their research on exchange rate prices which they determined did not provide sufficient proof for the weak-form efficient market hypothesis (i.e., they found that markets are predictable with repeating trends). In their research, Garcia et al. selected 10 random Fridays to compare exchange rates between the U.S. dollar and the Swiss Franc. The research was run using the Augmented Dickey-Fuller test for 10 randomly selected Fridays over a 27-month period (2009 – 2011). Based on the research results, the researchers found that the *t*-values were less than the Dickey-fuller values on eight of the days and thus the null hypothesis was not rejected, indicating that the market is inherently inefficient at some level. However, Garcia et al. evaluated the foreign exchange market on random Fridays and did not evaluate share prices (Garcia et al., 2012). This study is not robust because only ten days are used in the research over the 27-month period. Additionally, Fridays were used in the study and are known to have certain characteristics different from other days of the week. Further research in this area should be conducted to cover more data points and factors in addition to exchange rates.

Researchers hold different views on the efficient market hypothesis. These views vary based on the type of research and discipline or professional application of the research. The efficient market hypothesis is commonly used in economics, finance, and accounting research. Different arguments in support of or in opposition to the efficient market hypothesis should be carefully evaluated to ensure that the theory is applied appropriately. Various researchers make assumptions not explicitly stated in the efficient market hypothesis.

As described above, some researchers have found evidence against the robustness of the efficient market hypothesis (Boettke, 2010; Brown, 2011). For example, researchers have evaluated long-term market reactions to earnings restatements pertaining to the efficient market hypothesis using the Cumulative Abnormal Returns (CAR) approach to measure stock performance and found that restatements of earnings violate the efficient market hypothesis (Xu, Jin, & Li, 2009). The CAR approach requires researchers to evaluate the difference between the expected return and the actual return on a share (Khin, Lim Keng, & Chong Wei, 2011). However, some problems have been identified with this approach. Specifically, Xu et al. (2009) explored the market efficiency of information from firms with restated financial reports (firms are often forced to restate earnings after fraudulent activity or errors). They identified problems in the CAR approach with regard to long-term stock performance because of the simple summation used in the technique. The companies used in their study were selected from the Government Accounting Office (GAO) from January 1997 through December 2002. Xu et al. took the accounting and data returns for each selected company from the COMPUSTAT and CRSP databases. Results from their study indicated that the CAR,

BHAR (buy and hold abnormal return), and calendar time portfolio approaches all show that no significant abnormal returns existed. As a result, these findings supported the efficient market hypothesis. This study improved upon previous studies by using multiple statistical methods to correct for known problems in the CAR method. The researchers accounted for external, unrelated factors in the research and focused on improving methods to evaluate the efficient market hypothesis. Further studies using this approach can be conducted with more recent data to evaluate market efficiency after the economic bubble in 2007.

The efficient market hypothesis explains share behavior in three different variations. The weak version of the efficient market hypothesis is based on an assumption that all information regarding past price fluctuations is reflected in current prices; the semi-strong version is based on the assumption that current market prices reflect all public information, both past and present; and the strong version is based on the assumption that current market prices reflect all public (past and present) and private information (Glen & Hornung, 2005). Further discussion of each version of the efficient market hypothesis is required to better understand the theory and how it applies to fluctuations in share prices as a result of fraud.

Strong-form. In the strong-form of the efficient market hypothesis, all information is reflected in the share price (Rao, 2007). Thus, any type of stock analysis is deemed useless and insider information is of no use for predicting future market prices. In other words, under the strong-form of the efficient market hypothesis, a random stock pick will do as well as one selected by careful analysis from financial experts. Rao (2007) stated that in a perfectly efficient market, the strong-form of the efficient market

hypothesis should hold true. The problem with this form of the theory is that a perfectly efficient market does not exist (Yen & Lee, 2008). Proponents, however, indicate that the predictability that occurs in the markets occurs from "time-varying equilibrium expected returns generated by rational pricing in an efficient market that compensates for the level of risk undertaken" (Rao, 2007, p. 34).

Rao (2007) conducted a research study to test the strong-form of the efficient market hypothesis. The purpose of the study was to establish if managed funds resulted in a higher return than passive investing. To conduct the research, 181 companies were randomly selected between 2003 and 2006 from the Bombay Stock Exchange (BSE200). During the study, 30 different portfolios were tested by comparing the portfolios to the three-year average returns in the mutual fund industry. The study results indicated that only two mutual fund portfolios had a return above the lowest average rate of return for the random portfolios. Thus, Rao concluded that mutual funds do not outperform passive investing and that investing in a random portfolio results in comparable returns to fundamental investing. The results support the strong-form version of the efficient market hypothesis. The data and methods used in this study provided reliable results. However, the research conclusions cannot be generalized outside of the BSE200. Thus, this study will need to be performed on multiple stock exchanges with varying levels of market efficiency to fully test the efficient market hypothesis. Likewise, Himmelmann, Schiereck, Simpson, and Zschoche (2012) found that share price changes (both increases and decreases) are followed by average share price returns. This research also used the cumulative abnormal return to evaluate price patterns in various national markets. The researchers used the event-study methodology for 71 firms listed on the EuroStoxx 50

exchange between 1999 and 2003. The cumulative abnormal returns for 12 months prior to the significant event (t = -5.98) and six months prior to the significant event (t = -6.88) were both significant at the 1% level, thus supporting the efficient market hypothesis. Additionally, the cumulative abnormal return for the six, 12 and 24 months after the event were not significant, thus further supporting the efficient market hypothesis. Finally, the study evaluated industry and country specific effects to ensure noise was not included in the study. This study was thorough and included analysis of factors outside of the research that could affect the study results. Furthermore, the researchers evaluated data both before and after the event-date to ensure the efficient market hypothesis was thoroughly tested surrounding market events. The study results strongly support the efficient market hypothesis rather than the behavioral finance hypothesis.

Recent scandals involving insider trading have failed to provide support for the strong-form of the efficient market hypothesis. In these cases, insiders could profit from knowledge that was not public information (Ilg, 2010). The market crash of 1987 identified factors outside of market information that had an effect on share prices (Boettke, 2010). As a result, securities did not reflect their true fundamental values. Another problem with the strong-form of the efficient market hypothesis is that small firms have been shown in empirical studies to earn abnormally high returns contradictory to the theory (Glen & Hornung, 2005). Researchers have also found that share prices experience predictable abnormal price increases from December to January (Boettke, 2010). Overreaction to press releases also fails to provide supporting evidence to this theory along with proof that low-valued shares tend to have high future values (Ilg, 2010). This contradicts the theory because researchers have found some factors have a

statistically significant ability to predict share price direction. The researchers of this study, like many others, only looked at specific anomalies within a share market. As a result, the researchers were able to identify that perhaps a perfectly efficient market does not exist; however, an evaluation of the market efficiency as it pertains to the efficient market hypothesis was not fully performed.

Additional research surrounding day-of-the-week trading differences in stock markets offer little support for the strong-form of the efficient market hypothesis. Muhammad and Rahman (2010) studied a previously documented anomaly in the stock market known as the day-of-the-week effect in the Malaysian stock market. This phenomenon resulted in documented calendar anomalies based on the day of the week and also during the month of January. The purpose of Muhammad and Rahman's study was to determine if the return on common shares is evenly distributed throughout the week and to determine if the volatility of stock market returns has changed over time. They used daily share data from January 1999 to December 2006 from the Kuala Lumpur Composite index (KLCI; Muhammad & Rahman, 2010) and described whether stock returns showed different effects for each day of trading. This secondary data included 2,085 stocks from the KLCI; the index returns were calculated, and the ordinary least square method was used to estimate the day-of-the-week effect. The researchers performed a longitudinal study from 1999 – 2006 using descriptive statistics to identify that Monday had the lowest index mean (786.30) and the lowest standard deviation whereas Friday had the highest index mean (788.11) and Thursday had the lowest standard deviation. The researchers found that the day-of-the-week effect was present in the Malaysian market, a finding consistent with other studies conducted by Kok and

Wong (2004) and Mansor (1997; who found that Monday had a lower average return than Friday). One explanation for this effect is the existence of weekend data that is incorporated into the markets on Monday (Mansor, 1997). Although this is an anomaly, this view does support the efficient market hypothesis, as additional data is quickly included in share prices. The problem with these studies is that they lack robustness because only descriptive statistics were used. Additionally, the studies were performed on stock exchanges that are already known as less efficient than the stock exchanges in the United States. These studies also evaluate short-term changes and not the longer-term effect of significant events on the exchange index.

Supporters of the strong-form of the efficient market hypothesis identify that mutual funds do not exceed market prices (Milburn, 2008). This is consistent with the theory in that abnormally high returns are not possible, and relationships between past and current performance are nonexistent. Additionally, researchers focusing on the ability to predict share prices have not found a share prediction method (Boettke, 2010). Milburn (2008) provided additional evidence for the strong-form version of the efficient market hypothesis: that technical analysis of share prices has been ineffective in predicting share prices. As a result, past performance is still not proven to predict current performance. Arguments for the strong-form version of the efficient market hypothesis include the idea that a rational bubble exists when the security price is different from its fundamental market value (Prentice & Donelson, 2010). This rational bubble can result in investors retaining the security even though differences exist because of the expectation of receiving higher prices for the security.

Another group of supporters (e.g. Ball & Brown, 1968; North & Buckley, 2010) found that instead of assuming an efficient market, regulators should focus on long-term market efficiency to encourage the efficient allocation of scarce capital. Thus, according to North and Buckley (2010) regulations could enhance efficient market operations by promoting disclosure and competition among companies. North and Buckley argued that through proper regulation (focused on long-term efficiency) the efficient market hypothesis holds true and encourages long-term market efficiency. Thus, rather than focusing on short-term inefficiencies (generally existing in all markets), the focus was on regulations to promote a long-term efficient market. Research has supported this idea.

For example, Ball and Brown (1968) found that the market anticipated earnings throughout the year and that 85% of price adjustments occurred prior to the release of the annual report, with the remaining 15% adjustment incorporated at the release of the annual report. The study researchers evaluated monthly corporate income and closing share prices between 1946 and 1966 for established firms listed on the NYSE. The income regression equation was used to determine if annual income is related to stock prices. Based on the study results, only minor short-term inefficiencies occurred and were corrected when the information was published. As a result of the study, North and Buckley (2010) found that short-term policies are counterproductive and result in weak regulatory frameworks. Long-term market efficiency regulations, on the other hand, promoted pubic transparency, accountability and efficient markets. The problem with Brown and Ball's study is that it only used established firms and cannot be generalized to the entire population of companies listed on the NYSE. In addition, only monthly income was used which does not provide as robust results as daily share prices. Based on

these studies, private corporate information is included in share prices prior to a public announcement, thus supporting the strong version of the efficient market hypothesis.

Semistrong-form. The semistrong-form of the efficient market hypothesis claims that share prices reflect all current publicly available information and that the price is updated to reflect new information (Rao, 2007). Thus, share prices adjust quickly to new information in an unbiased fashion. Identifying a market with the semi-strong version of the efficient market hypothesis requires identifying instantaneous price changes to previously unknown information.

Westfall (2010) conducted a study and evaluated the semistrong-form of market efficiency by analyzing the role of stock split announcements on share price. In this study, the researcher tested market efficiency by analyzing a sample of 30 stock split announcements and the effect of those announcements on share price from 180 days prior to the stock split through 30 days after the split. The stock split announcements were randomly selected and tested using an event-study methodology. The results of Westfall's study indicated that stock splits increased corporate share price up to 29 days prior to the announcement. Additionally, in testing for market efficiency, a significant positive reaction of the excess adjusted returns and the cumulative average excess returns was found at the 10% level of confidence. Thus, the author's research results supported the null hypothesis that an investor is not able to earn above normal returns by acting on a public announcement for a two for one stock split. These results supported the efficient market hypothesis at the semistrong-form. One concern with this study is that the CAR approach is known for problems based on the long-run return of share prices. This

research study could be conducted for more than 30 stock split announcements using a CAR that is adjusted to account for the long-term performance of the shares.

Wilson and Marashdeh (2007) explored the relationship of co-integration of stock markets and the efficient market hypothesis. The foundation of this research was Malkiel's (2003) conclusion that above-average returns cannot exist without above-average risks. The purpose Malkiel's research was to evaluate long-term market efficiency as it relates to the co-integration of stock markets. Wilson and Marashdeh (2007) proposed that markets must be efficient in the long-run because arbitrage opportunities do not exist. However, in the short-run, arbitrage activity provides risk-adjusted, above-average returns. Wilson and Marashdeh used a growth model including transaction costs to reflect the firm's higher share price. A two-country sample was used to explore the real exchange rate using the growth model and the researchers reported that long-run equilibrium allows systematic profits to be obtained in the short-run. As a result, disequilibrium indicated short-run market inefficiency from arbitrage activity. However, in the long-run, this inefficiency results in market efficiency, thus supporting the semistrong-form of the efficient market hypothesis.

Tas and Tokmakçioğlu (2010) also studied the efficient market hypothesis and co-movement among emerging markets. Their research study was performed to investigate stock market co-integration using 11 emerging stock market indices. Tas and Tokmakçioğlu used weekly data from January 2002 to December 2008. A time series analysis was used to test the existence of co-integration among emerging markets and a co-integration model to explain the relationships between emerging markets was developed. The researchers concluded that in developing markets, the efficient market

hypothesis was supported in that the research did not prove that profits and returns are above normal because of market inefficiency. Thus, Tas and Tokmakçioğlu agreed with Wilson and Marashdeh (2007) in that the efficient market hypothesis is supported in markets of varying efficiency levels and that new information is integrated efficiently into share prices.

Weak-form. Whereas the semistrong-form of the efficient market hypothesis claims that share prices include all past and present information, the weak-form indicates that that share prices are formed only through current information (Nurunnabi, 2012). The weak-form of the efficient market hypothesis claims that share prices cannot be predicted based on past performance (Easton, 2007). In addition, this version indicates that excessive profits are not possible in the long run by using investment strategies based on past share prices (Ilg, 2010).

Aga and Kocaman (2008) performed research on the Istanbul Stock Exchange (ISE) to test weak-form efficiency. The ISE consists of large, liquid firms with widely held stock. The hypothesis in this study was that the ISE is weak-form efficient and a time-series model was used to test the hypothesis. Shares used in the study had to have a high trading volume relative to other shares in the market, and share trades were not interrupted for any reason by the authorities. The study was based on an efficient market where an investor could not exploit information because share prices had already adjusted to that information. Aga and Kocaman indicated that the ISE is weak-form efficient because historical share prices are reflected in the share ($t = 4.578, p = .000$). Similarly, other researchers identified emerging markets as weak-form inefficient due to information inefficiency, but also found that these markets are evolving in market

efficiency (e.g., Harrison & Moore, 2012). Aga and Kocaman (2008) identified that the efficient market hypothesis exists at different levels of efficiency in stock markets.

Emerging markets have a less efficient market than stable markets. A study to evaluate market efficiency through a detailed literature review of research in emerging economies was also performed that identified the presence of weak-form market efficiency in emerging economies (Nurunnabi, 2012). The efficient market hypothesis applies rational expectations to securities prices in public markets. The efficient market hypothesis is controversial among economists because of studies that have shown possible abnormal share returns as a result of the predictability of some classes of stock (Ilg, 2010). However, emerging markets reflect a movement toward more efficient information, and thus a more efficient market over time indicates the potential need for more laws and regulation to aid the markets in becoming more efficient (Harrison & Moore, 2012).

Ilg (2010) stated that financial statement fraud is one factor that affects this theory. Private information is often not reflected in the share price of a company. Accounting data is relevant to the efficient market hypothesis because it produces an effect in market behavior (Easton, 2007). Here, the market is assumed as efficient because accounting data is analyzed and results in an adjustment to the market share price without bias. However, accounting data does not always explain the process used to determine the figures. In fact, Easton (2007) used the efficient market hypothesis to determine if private knowledge of fraud is reflected in share prices prior to the announcement of fraud. Thus, if fraud is reflected in the share price, the strong-form of

the efficient market hypothesis indicates the share price is reliable. Additionally, unusual share price fluctuations can be further explored as an indicator of fraud.

Summary of the Research on the Efficient Market Hypothesis

The efficient market hypothesis was introduced in the 1960s by Eugene Fama as an investment theory that explained the inability of investors to "beat the market" (Fama et al., 1969). According to the theory, outperforming a financial market is impossible because market efficiency ensures share prices incorporate all relevant information (Glen & Hornung, 2005). The efficient market hypothesis provides researchers with the ability to evaluate share prices in three different forms of market efficiency: the strong-form version of the theory occurs when all relevant data (both past and present) and information not publicly available is incorporated into the share price: the semi-strong version of the theory indicates that market efficiency occurs when share prices include current and past public information: the weak-form version of the theory postulates that when share prices only incorporate current public information into the share value market, efficiency is achieved (Harrison & Moore, 2012). Financial researchers often use this theory to identify market efficiency.

Several researchers have used the efficient market hypothesis to evaluate the efficiency of a specific financial market (e.g., Sharma, 2009; Tas & Tokmakçioğlu, 2010). This theory is used by researchers to establish a level of market efficiency for firms in new markets, emerging markets, and in established markets (Harrison & Moore, 2012; Ilg, 2010). Although many researchers use the efficient market hypothesis as a foundation for research, opinions vary on the accuracy of the theory.

Dissenters of the efficient market hypothesis claim that the theory makes assumptions not applicable to all situations (e.g., Illg, 2010; Glen & Hornung, 2005). For example, researchers found that it was possible for company insiders to profit from private corporate information, and that investors could profit during an economic bubble (in which share prices rise and then drop sharply), both of which disprove the efficient market hypothesis (Glen & Hornung, 2005; Ilg, 2010). Likewise, investors found that share prices experience predictable patterns both within specific months and during specific days of the week (Boettke, 2010; Muhammad & Rahman, 2010). Regardless of the research disproving the efficient market hypothesis, proponents find equivalent proof that supports the theory.

Proponents of the efficient market hypothesis praise the theory for the explanation provided by the theory for market efficiency. For example, some researchers indicated that the theory is accurate within the original boundaries of the theory; in other words as long as the theory is used as it was originally intended, the theory provides a foundation for financial research as a theoretical foundation (Ball, 2009; Ball & Brown, 1969; Milburn, 2008). Further research evaluates the efficient market hypothesis using current applications.

The efficient market hypothesis is applied to research studies to identify the efficiency of share markets. In addition, the hypothesis is used to explain share price behavior in different markets. In evaluating the efficient market hypothesis, it is important to consider different applications of the theory to the markets. Economic and industrial changes often affect the share market. As a result, evaluating the theory using current applications is critical to fully understanding the theory.

Current Applications of Efficient Market Hypothesis

Applying the efficient market hypothesis to current economic situations and new markets has resulted in mixed opinions on the accuracy of the theory (e.g. Brown, 2011; Yen & Lee, 2008). Debate and criticism of the efficient market hypothesis continued after the global financial crisis in 2008 (Mehrara & Oryoie, 2012). Much of the criticism spawned blame regarding the efficient market hypothesis, which was based on the idea that financial markets exploit all available information when setting security prices (Brown, 2011). Ball (2009), however, argued that the efficient market hypothesis is a good theory, but with limitations. For example, the theory cannot be used to predict future events, and outside market and economic factors (noise) can interfere with share prices, resulting in incorrect share purchase decisions. These limitations are not different from other theories. Regardless of the limitations, Ball (2009) reported that the criticisms of the theory are exaggerated. Unlike critics (e.g., Das, 2010; who found the theory invalid) and proponents (e.g., Yen & Lee, 2008; who found the theory realistic and accurate) of the efficient market hypothesis, Ball (2009) praised the efficient market hypothesis as a good theory with some limitations. Misunderstandings of the theory can be avoided by understanding the limitations and purpose of the theory.

It is important to outline what the efficient market hypothesis states and does not state to ensure the theory is understood. Ball (2009) identified five basic unstated facts regarding the efficient market hypothesis. First, the theory does not state that no one should act on information. In other words, investors are not passive in selecting stock portfolios. Contrary to this idea, Das (2010) indicated that the efficient market hypothesis prevents active investing because the amount of information in the market is

too abundant. The problem with Das's perspective is that Das, unlike Ball, assumed that the efficient market hypothesis states that individuals will act on all of the available information whereas Ball assumed that investors will act on information deemed pertinent. Thus, it is impossible to criticize the efficient market hypothesis because of an investor's inability to make decisions based on available information.

The second assumed unstated indicator (according to Ball, 2009) of the efficient market hypothesis is that the market should have predicted the global financial crisis. The efficient market hypothesis does not imply that future share prices or market performance can be predicted. In this situation, investors assume that because share prices reflect all available information, such information will be an indicator of future returns. In fact, the efficient market hypothesis does not make this statement. Ball also noted that some researchers and investors believed that the market should have known an asset "bubble" existed. This belief is contrary to the efficient market hypothesis.

Bubbles are phenomena in which security prices rise substantially and fall suddenly, and identification of financial bubbles generally occurs after the occurrence but not before (Sutter, Huber, & Kirchler, 2012). Bhattacharya and Xiaoyun (2008) agreed that financial bubbles could not be predicted prior to the occurrence. A strong implication of this theory is that no one can predict future economic events such as market collapse or economic bubbles (Brown, 2011). As a result, the efficient market hypothesis is a useful benchmark to use both in academia and in practice.

Another argument against the efficient market hypothesis was that the collapse of large financial institutions (as those evaluated in Iceland) indicated an inefficient market (Benediktsdottir, Danielsson, & Zoega, 2011). Although researchers disagreed on this

point, Ball (2009) indicated that the failure of large companies demonstrates that competitive capital markets result in losses when risky financial positions are financed with leverage, thus supporting the efficient market hypothesis. Finally, Ball argued that the efficient market hypothesis does not state that return distributions do not change over time, and other experts (i.e., researchers, financial analysts) in the field agree (Milburn, 2008). Regardless of the opposition, the efficient market hypothesis exists in a flawed capital market even though the market is the most efficient market in processing information (Yen & Lee, 2008). As illustrated above, researchers and financial analysts alike make many inaccurate assumptions (that they assert are part of the efficient market hypothesis when they are not) about the efficient market hypothesis and its role in evaluating capital markets.

Ball (2009) used the foundation of the efficient market hypothesis, explored explicit theoretical statements, and applied the theory to the current markets. As a result, the efficient market hypothesis was evaluated on its original framework, and this framework has been applied to the framework of the modern market. Financial theories require this type of change to remain current with economic and industrial changes affecting capital markets. One current application of the efficient market hypothesis is to explore emerging share markets using the theory to study market efficiency in the new market.

Efficient market hypothesis in emerging markets. Once the efficient market hypothesis was viewed from the perspective it was originally intended to be viewed from, Ball (2009) evaluated the theory based on how the theory applies to new areas (such as emerging markets). As noted earlier, Tas and Tokmakçioğlu (2010) used the efficient

market hypothesis to investigate market efficiency in emerging market countries. In their study, the researchers considered technology and communication developments (in a global economy) in evaluating market efficiency. The efficient market hypothesis, when created, did not have to consider modern technological factors and global business (Yen & Lee, 2008). As a result, the application of the efficient market hypothesis requires careful consideration of external market and technological factors in addition to the relationship of the theory to its theoretical application.

Tas and Tokmakçioğlu's (2010) study was conducted using co-integration to assess the relationship between the data in a non-stationary time-series. Although the risk of miscalculation between variables is rare, it is not absent. The traditional approach to evaluating changes in the degree of integration among stock markets is the change in correlations over time. However, correlations are affected by short-term trading noises and market relationships (Assidenou, 2011). Assidenou (2001) stated that the approach used by Tas and Tokmakcioglu (2010) corrected for the correlation problem and was recognized as effective by researchers in economics and finance. According to Granger (1986) an efficient market should not have two or more price series because the result is one market predicting another. This observation helps evaluate the existence of an efficient market. Assidenou (2011) also noted that there were problems with the co-integration method because the analysis method can lead to incorrect inferences when the equilibrium relationship is multivariate. Evaluating this risk requires the use of the multivariate Trace statistics to ensure stock markets are not pair-wise co-integrated.

Assidenou's (2011) research study successfully used co-integration with the efficient market hypothesis to study emerging markets. The application of this method

contributes to the efficient market hypothesis theory by introducing an additional method for use in testing the theory and in testing data using the efficient market hypothesis. As a result, in this research study, the researcher used an existing theory in a deductive research study to apply a different method in testing capital markets to identify a method that works better in emerging markets.

Researchers recognized that the efficient market hypothesis is used for a variety of market analyses including the simple evaluation of past prices and the more complex evaluation of insider trading (Assidenou, 2011; Ball, 2009; Tas and Tokmakçioğlu, 2010). Market efficiency is important in most countries but is generally lacking in emerging countries because of a lack of information efficiency. Tas and Tokmakçioğlu's (2010) study demonstrated the importance of market efficiency and the lack of efficiency in emerging markets and introduced new methods to use in testing market efficiency. The assumption that efficient markets exist based on the efficient market hypothesis was the foundation for this study. Thus, this study added to the theory by applying the theory differently in non-efficient markets. Application of this theory was appropriate, and the theory was not used outside of the original intent of the theory. In addition to using the efficient market hypothesis to assume market efficiency, researchers also use the theory to prove or disprove market efficiency.

Researchers (e.g. Gupta, 2008; Karnik, 2005; Sharma 2009; and Singla, 2007) have used the efficient market hypothesis as the theoretical foundation to determine market efficiency. Market inefficiency exists when investors can act on information before the information is public and earn abnormally high returns. Yen and Lee's (2008) study investigated the effect that open stock offer announcements had on share price to

determine market efficiency in the Indian market. Yen and Lee identified a gap in the research testing efficient markets for open offers and the ability of investors to create value from such offers. In their study, Yen and Lee found that the correlation statistic prior to foreign buying (r_s = .081) varied from the statistic after foreign buying (r_s = −.154) and found foreign investment did have an effect on share prices in the Indian market. Previous researchers who have evaluated the semi-strong form of capital market efficiency have covered stock splits, rights issues, mergers, new holdings, and dividend disclosures but not open offers (Gupta, 2008; Karnik, 2005; Singla, 2007). The researchers conducted the study using robust methods to achieve reliable results. The evaluation of open offers closed a gap in the study of the efficient market hypothesis. However, this study should be conducted in multiple stock exchanges to further evaluate the efficient market hypothesis in different markets of different efficiency levels.

Sharma's (2009) study used the public announcement date of the open offer as the event-date in the study. The researcher used the event-study (referenced above) method and the efficient market hypothesis to test the Indian stock market for market efficiency. In this research study, the researcher used the public announcement date of the open offer as the event date in the study. The event-study method was used, and the cumulative abnormal return was calculated to identify abnormal share price returns. The cumulative abnormal return 15 days prior to the announcement date was significant (p = .038) and the cumulative abnormal return at 7 days was even more significant (p = .029), thus rejecting the null hypothesis. Based on the study results, the Indian market is not efficient in the semi-strong form as defined by the efficient market hypothesis. Investors could obtain abnormal returns from open announcements. Sharma's results indicated that

investor's have prior information regarding public announcements, which therefore raises questions surrounding the effectiveness of insider trading regulations. Further expansion of this study should be done to evaluate additional share markets. The findings of this study can be used by researchers to further evaluate market efficiency and the reliability of the efficient market hypothesis in different markets.

Sharma (2009) used the same methodology and interpretation of the efficient market hypothesis as researchers Gupta (2008), Karnik (2005), and Singla (2007). The difference in this study was the testing of open offers. The efficient market hypothesis was applied to different financial events and phenomena. As a result, the efficient market hypothesis should be evaluated based on applicability to the study performed. The efficient market hypothesis states that in an efficient market, securities prices reflect all available public information (Ball, 2009). As a result, the use of this theory to test open offers is appropriate.

The premises used in the proposed study are limited to the basic theory and do not go beyond the theory, and the reasoning behind using the efficient market hypothesis is sound. In the proposed study, I do not challenge the theory and instead will use the theory as a foundation for my research. This research will add to the body of research by exploring the effect of fraud on share prices: share price changes occurring prior to fraud support the efficient market hypothesis, whereas a lack of share price change disproves the theory. As a result, the assumptions surrounding the theory are important and these assumptions do not go beyond what the theory allows. In evaluating the use of the efficient market hypothesis for my research, it is important to review studies involving unexpected market events in addition to evaluating the theory in new markets.

Efficient market hypothesis in the study of market surprises. Not only do researchers evaluate market efficiency in emerging markets, but they also evaluate the theory for market surprises (unexpected market events). Bush, Mehdian, and Perry (2010) explored the efficient market hypothesis in conjunction with the overreaction hypothesis (OH) and the uncertain information hypothesis (UIH). The efficient market hypothesis assumption (used in this research) was that financial markets are considered efficient when the market is in equilibrium. In their research, Bush et al. found that the F-statistic for the variance of non-surprise days to post market surprises is significant ($F = 1.36, p = .01$). Bush et al. acknowledged the different forms of the efficient market hypothesis used in research and identified the fundamental criticism that opportunities to earn greater than average returns do exist in the market and thus are exploited by investors. Another criticism of the efficient market hypothesis identified in this research study is that investors do not always act rationally. Here, some investors overreacted to new information; thus, the OH was introduced to explain the short-term effects of the overreaction (Bush et al., 2010).

Finally, to explain the under-reaction to good news by investors, the UIH is introduced as support. These latter two theories can be used to explain situations when the efficient market hypothesis is not sufficient to explain security prices. The researchers (Bush et al., 2010) investigated investor reaction to unexpected information, both positive and negative, on the NASDAQ Composite Index. Bush et al.'s study resulted in evidence that abnormal returns existed within the composite and sub-indexes, which was consistent with the UIH. Likewise, Yen and Lee (2008) conducted empirical

tests of behavioral studies that confirmed the efficient market hypothesis in findings that investors make mistakes by overreacting to business firm records of success and failure.

The research findings described above indicate a gap in the research on the efficient market hypothesis and sub-indices. The importance of this research is that it incorporates additional theories to explain situations in which the efficient market hypothesis does not apply, or has not provided evidence to effectively explain the phenomena (Yen & Lee, 2008). Further support for the OH was provided by researchers who looked at the OH in the Chinese stock market (Wu, 2011). Although Wu used the event-study methodology (which weakened the study), the research was based on the correct theoretical premises of the efficient market hypothesis.

When using the event-study methodology, the researcher assumes that the market is efficient (Yen & Lee, 2010). As a result, caution must be exercised in the efficient market assumption based on the market used and the research supporting the efficiency of that market. Bush et al. (2010) exercised caution and avoided using the efficient market hypothesis beyond what the theory originally intended. Regardless, by using the efficient market hypothesis, the OH, and the UIH, Bush et al. (2010) and Wu (2011) linked the efficient market hypothesis to the practical application of efficient markets by using alternate theories to explain criticisms of the theory.

In a similar study conducted by Mehrara and Oryoie (2012), the efficient market hypothesis was used to evaluate market efficiency in foreign exchange markets surrounding the financial crisis of 2007. The researchers concluded that exchange rates were independent and identically distributed prior to the financial crisis but were not after the crisis. As a result, Mehrara and Oryoie concluded that the efficiency of foreign

exchange markets declined after the financial crisis. In addition to evaluating the efficient market hypothesis in new situations and during unexpected market changes, it is important for researchers to test the theory through random testing.

Efficient market hypothesis in empirical random testing. Regardless of market surprises and new share markets, researchers must test the efficient market hypothesis within a normal market scenario. Rao (2007) used two investment portfolios: one carefully selected and one randomly selected to test the efficient market hypothesis to see if abnormal returns can be achieved in an efficient capital market. His study followed the efficient market hypothesis assumption that share returns do not follow patterns, and as a result, abnormal returns cannot be obtained by investors who develop trading strategies (Yen & Lee, 2008). In his literature review, Rao (2007) evaluated the different forms of the efficient market hypothesis (weak, semi-strong, and strong) and the controversies surrounding the theory. He selected shares from the Bombay Stock Exchange (BSE) 200 for three years and random portfolios were built from the shares. The average annual returns were calculated and compared to the three-year average returns of mutual funds. Mutual funds were assumed to have carefully selected security portfolios to achieve higher than normal returns. Rao found that only two mutual fund schemes exceeded the lowest average return of the random portfolios. The range between the lowest random portfolio and the mutual fund was only 4.56%. The critical t-score for the test was t =3.29. The t-statistic for the 30 stock random portfolio (t =8.99), the 20 stock random portfolio (t = 15.79) and the 10 stock random portfolio (t =14.03): all exceed the critical t for the mutual funds. Thus, Rao concluded that random portfolios selected from index-based stocks are as effective as strategically selected portfolios.

Results from this study are similar to studies by Milburn (2008) and Tas and Tokmakçioğlu (2010). The biggest limitation with Rao's (2007) study was that it only used a three-year average for stock prediction. Researchers who have examined share-based studies have found that daily share prices provide a better study than monthly and yearly price studies (Assidenou, 2011; Gong &Tse, 2009). Thus, the methodology used can be questioned based on applicability to the study. Therefore, additional research on this should be performed using more frequent price quotes to identify abnormal returns occurring throughout the year. Although much research on the efficient market hypothesis has focused on share prices and the formation of those prices in the market, the reliance on those prices must still be studied to ensure the resulting share prices matter to stakeholders.

Fraud-on-the-Market Theory

The focus of the efficient market hypothesis is an individual's reliance on a share price in light of a misstatement. In contrast, the focus of the fraud-on-the-market theory is on the effect of a misstatement on the price of a security and on the presumed reliance on the price (Dunbar & Heller, 2006). By means of the fraud-on-the-market theory, plaintiffs could use reliance on the efficient market hypothesis to prove financial harm.

Opponents of the fraud-on-the-market theory questioned the need to prove an efficient market. For example, according to Korsmo (2011), plaintiffs alleging market manipulation should be required to show loss causation rather than prove market manipulation. Some researchers (e.g., Dunbar & Heller, 2006; Korsmo, 2011) believed that financial anomalies identified in securities markets are inconsistent with the efficient market hypothesis. According to this argument, to determine if the fraud-on-the-market

presumption applies, proof of the misrepresentation affecting the share price should be required.

Support for the fraud-on-the-market theory came from economic studies of accounting fraud. Kedia and Philippon (2009) found that earnings management practices were accompanied by higher levels of investment and hiring to mimic good management and productivity. These higher levels distort economic resources, thereby misleading investors. In addition, attorneys litigating cases of insider trading rely on the fraud-on-the-market theory to prove reliance on share prices that have been manipulated through nonpublic information (Ilg, 2010). Thus, both supporters and opponents of the fraud-on-the-market theory believe that the theory is aligned with loss causation, rather than proof of an efficient market.

One of the strongest arguments in favor of the fraud-on-the-market theory was based on the mispricing of shares during share price inflation of the late 1990s (Dunbar & Heller, 2006). As a result of this mispricing, Dunbar and Heller (2006) reviewed other factors of the share price description, including reliance, materiality, and causation. The fraud-on-the-market theory is directly related to the study of financial fraud. The fraud-on-the-market theory offers an explanation of nonpublic manipulations that alter the share price, resulting in stockholder losses.

Hammer and Groeber (2007) explored legal proceedings using the efficient market hypothesis and the fraud-on-the-market theory to determine the outcome on legal proceedings based on the judge's interpretation of these finance theories. These authors evaluated securities litigation based on whether or not a case reached the jury and the judge's interpretation of the procedural rules. Their findings linked finance and

economics to law. The authors explored legal precedents that occurred in the 1990s from the fraud-on-the-market theory. The Supreme Court approved the fraud-on-the-market theory in the court case Basic, Inc. v. Levinson, 485 U.S. 224 (1988: Hammer & Groeber, 2007). The court relied heavily on the efficient market hypothesis in proving the theory but did not indicate the form of the theory (strong, semistrong, or weak).

As a result, attorneys are left to prove an efficient market during litigation. The result of this ruling is to eliminate the obligation of proving that each individual investor relied on the fraudulent statements to recover losses. As a result, the weak-form of the efficient market hypothesis is used as a foundation for the fraud-on-the-market theory. Specifically, Hammer and Groeber (2007) stated that this weak-form of the efficient market hypothesis was evident in the Enron scandal where shareholders assumed purchased shares were correctly priced when short-selling while fraudulent financial statements were affecting the price. Because of the new financial and economic environments, judges must remain current with financial theory and the effect that theory has on related legal cases.

Support for the fraud-on-the market-theory came from economic studies for accounting fraud. According to Kedia and Philippon (2007), earnings management practices are accompanied by higher levels of investment and hiring (to mimic good management and productivity). This in turn creates a distortion in economic resources that can mislead investors. In addition to earnings management practices, cases of insider trading (including the Martha Stewart and Goldman Sachs cases) have relied on the fraud-on-the-market theory to prove reliance on share prices that have been manipulated through non-public information (Ilg, 2010). These cases have forced courts to reevaluate

the fraud-on-the-market theory in relation to the efficient market hypothesis (Dunbar & Heller, 2006; Elliott et al., 2010; Glen & Hornung, 2005). Supporters and opponents alike find the fraud-on-the-market theory aligned with loss causation instead of proof of an efficient market (Duffy, 2011; Erenburg, Smith, J., & Smith, R., 2011; Korsmo, 2011; Sinzdak, 2008).

One of the strongest arguments for the fraud-on-the-market theory was based on the mispriced shares during the stock price bubble of the late 1990s (Dunbar & Heller, 2006). As a result, situations existed where the strong-form of the efficient market hypothesis was not accurate. Dunbar and Heller (2006) stated that individuals should review the fraud-on-the market theory to identify other factors of share pricing such as reliance, materiality, and causation to prove losses.

Financial statement fraud occurs through the manipulation of financial statements to increase share prices and mislead investors (Hogan et al., 2008). As a result, the fraud-on-the-market theory is directly related to the study of financial fraud (Duffy, 2011). The fraud-on-the-market theory covers non-public manipulations that can alter the share price resulting in stockholder losses. The identification of share price fluctuations as indicators of fraud requires use of this theory in combination with loss causation to determine if the efficient market hypothesis is correct in determining if share price does include non-public information in the price (Hegazy & Kassem, 2010). In addition to a focus on theory, it is important to evaluate share price fluctuations in relation to fraud.

Share Prices and Fraud

Share prices fluctuate within the financial markets (Rosen, 2007). As a result, an understanding of capital markets and the effect of different factors in those markets on

share price is important. Capital markets facilitate the transfer of cash flows across time between buyers and sellers (Gould, 2009). Here, the intertemporal cash flow shifting (i.e. the movement of cash between financial periods to accommodate cash needs) is balanced so entities with a cash surplus provide funds for entities with a cash deficit. An efficient capital market is one in which the price of securities within the capital markets is based on all available information (Milburn, 2008). As a result, investors should be able to rely on the market prices of the financial instruments to make decisions.

Investors must balance the level of acceptable risk with all decisions within the financial markets. The two goals of financial markets are the shift in intertemporal cash flows and the transfer of risk (Braun & Larrain, 2009). Financial markets provide a method for companies to facilitate raising capital, transferring risk, and conducting international trade (Gould, 2009). Capital markets are analyzed using one of two approaches: technical analysis or fundamental analysis. Technical analysis relies on market data to predict future prices and trends (Vuković, Grubišić, & Jovanović, 2012). Gould (2009) noted that using technical analysis, the analyst does not consider the intrinsic value of the share and can thus apply the analysis to the entire market or to a single share. Likewise, Vuković et al. (2012) indicated that technical analysis does not follow the theory of market efficiency. Fundamental analysis, on the other hand is an attempt to identify the intrinsic value of the share price by considering economic, financial, qualitative, and quantitative factors. Gould (2009) stated that valuation of the share is compared to the current market price to determine the security's value. Likewise, Seng (2012) noted that fundamental analysis requires financial statements

(current and past) in addition to economic and industry specific data for analysts to identify the intrinsic value of securities.

Market prices are based on many market factors. Financial experts often consider these factors when attempting to develop a model to predict share prices. For example, Jasemi and Kimiagari (2011) evaluated three different models to develop a model that can accurately select share prices. Each model considered different factors including past closing share prices and share price changes during a single day and over a set time period. The solution presented in the research study included a module model that combined factors from different models to predict securities prices. The final model indicated that market psychology was another factor requiring consideration in the development of stock predictors. Other researchers noted that share price changes occur with third-party complaints (Casado-Diaz, Mas-Ruiz, & Sellers-Rubio, 2009). Here, information regarding negative corporate activity results in a decrease in share price. The models discussed above indicate that share price is sensitive to various market factors and available information. In addition to share price reactions to this type of information, share prices should also be evaluated for changes regarding corporate restructuring.

One factor found to affect share prices at the corporate level are initial public offerings (IPOs). An IPO occurs when a company issues stock for the first time to raise additional capital (Braun & Lorrain, 2009). After an IPO, the supply of shares is increased. Braun and Lorrain (2009) indicated that this increase in supply permanently lowers the share price of companies within the same market in addition to company shares that co-vary with newly issued shares.

In an effort to predict share prices, analysts can apply share price valuation models that consider the factors found to affect share prices (Sinaei, 2010). One popular model is the capital asset pricing model (CAPM: Berger, 2011). This model is used to calculate a theoretical investment price by comparing individual assets and market returns based on the perceived risks and trade-offs (Gould, 2009). Many problems have been identified with this model because return distributions are not always normal, among other issues related to the sensitivity of the model to assumptions of idiosyncratic and systematic company risk (Yalcin & Ersahin, 2011). Additionally, the CAPM assumes a symmetric market and does not always account for market changes resulting in model adjustments by researchers to improve pricing accuracy (Raei, Ahmadinia, & Hasbael, 2011). Roodposhti and Amirhosseini (2010) combined the CAPM with economic leverage to create a revised capital asset pricing model (R-CAPM) to further improve on the original. Results from their study indicated that the R-CAPM was the best predictor of expected return in the Iranian stock exchange and that a meaningful relationship between economic variables does not exist. Continued modifications to the CAPM indicate problems with predicting share prices in the market, which aligns with the efficient market hypothesis, supporting the idea that share prices cannot be predicted because they are already accurately priced within the market.

Capital markets consist of an abundance of complex information. The ability of analysts and stakeholders to accurately evaluate the information can affect the efficiency of the market. Hobson (2011) investigated the benefits of reducing the complexity of accounting information in markets prone to economic bubbles. He evaluated whether or not reducing the complexity of accounting information led to a greater processing of that

information, which in turn would lead to more efficient markets. Hobson found that in markets prone to bubbles, reduced accounting complexity led to greater information processing but did not translate to more efficient markets. The researcher suspected that market efficiency was not improved because the increased ability for analysts to process information led to an advantage over less informed traders. Because share prices fluctuate based on different economic and industry conditions, it is important to review share price fluctuations for companies known to have committed fraud.

Share Price and Fraud for Enron, WorldCom, and Competitors

Corporate share prices represent a measure of the value of a company and are indicators of economic conditions (Smith, 2011). Share price data are reliable as long as the investing public has access to the information necessary to make an investment decision (Hobson, 2011). Analysts suspect that information leaks regarding fraud are reflected in the share price prior to the announcement of fraud (Miller, 2006). This suspicion supports the efficient market hypothesis, according to which share prices reflect all information, both public and nonpublic. As a result, share prices should decrease prior to the announcement of fraud.

Researchers have found that declines in share prices were found to often occur shortly before and after the announcement of fraud (Albrecht et al., 2012; Ilg, 2010; Maguire, 2010). Enron, WorldCom, and many other companies have dissolved after the announcement of fraud when the corporate share price declined sharply (Hopwood et al., 2012). An employee, acting as a whistleblower, initially detected the fraud within Enron (Rockness & Rockness, 2005).

In a pilot study conducted at the beginning of this research project, the share prices of Enron and WorldCom were evaluated prior to fraud announcements. Two companies within the same industry were also evaluated based on NAICS code 486210. All data were obtained from the Mergent database. Table 1 shows the means, standard deviations, and ranges for Enron and two competitors (Southern Union and Burlington Resource) 12 months prior to the announcement of fraud. The standard deviation for Enron's share price was 26.56, or 68.99% of the mean. In contrast, the standard deviation was 8.16% of the mean for Southern Union, and 13.15% of the mean for Burlington Resource. The large standard deviation indicated that the share price of Enron fluctuated more than the share prices of the other companies. The standard deviation as a percentage of the mean for Enron was more than 5 times that for Burlington Resource, and more than 8 times that for Southern Union, which indicated large swings between high and low values.

Table 1

Daily Share Price Distributions: Enron, Southern Union, and Burlington Resource

Company name	*M* (*SD*)	*SD* as percentage of *M*	Range
Enron	38.50 (26.56)	68.99%	81.82
Southern Union	16.18 (1.32)	8.16%	6.54
Burlington Resource	20.46 (2.69)	13.15%	10.50

Daily share prices for Enron were visually inspected to identify any unusual fluctuations. In addition, share price changes were calculated for each company. The fraud at Enron was announced in October 2001. During the nine months prior to the fraud announcement, the price of Enron shares declined from $79.88 to $0.18 per share, or 99.77%. Consistent declines in share prices started in February 2001. In the month of

October 2001, the percentage of daily share price declined 52.32%. During that same month, the share price of Southern Union also declined, but only from $20.37 to $13.83, or 32.1%. Similarly, the share price of Burlington Resource ranged between $26.50 and $16.00 per share, a range of 39.62%. These disparities suggest the value of investigating the share prices of more companies to determine whether share prices declined more sharply for companies with pending fraud announcements than they did for companies with no pending fraud announcement is worthwhile.

To determine whether the Enron share price decline was an anomaly, WorldCom share prices were also evaluated along with industry competitors. Results from this evaluation indicated that WorldCom shares dropped significantly four months prior to the fraud announcement when compared to control companies in the same industry. Table 2 shows price distributions for WorldCom, Verizon, and AT&T.

Table 2

Daily Share Price Distributions: WorldCom, Verizon, and AT&T

Company name	*M* (*SD*)	*SD* as percentage of *M*	Range
WorldCom	13.78 (8.78)	63.72%	24.88
Verizon	42.40 (5.43)	12.81%	26.63
AT&T	31.01 (6.08)	19.61%	24.67

Although the disparities are not as great as those shown in Table 1, disparities between WorldCom and competitors were substantial for the standard deviation as a percentage of the mean. Whereas share prices for both Verizon and AT&T had a range less than the mean corporate share price, the range for WorldCom share prices was almost double the mean share price. This difference indicated a much greater volatility. For WorldCom, the standard deviation as a percent of the mean was more than 3 times

the value for AT&T and more than 5 times the value for Verizon. The high variance for WorldCom indicated an unstable share price during this period.

A visual inspection of the WorldCom share price changes during the 12 months prior to the fraud announcement confirms that share prices were unstable during that period. Share prices were obtained from the Mergent database and the change in share price was calculated in Microsoft Excel by subtracting the previous day share price from the current share price. The fraud for WorldCom was announced in June 2002. In February 2002, WorldCom's share price dropped from $24 to $10. A small price recovery occurred in March, with a continual decline beginning in April from $12 to $8 per share. In May, the month prior to the announcement, the WorldCom share price dropped to $5 per share. Thus, the share price was declining up to 6 months prior to the announcement of fraud. In comparison, during the same 6-month period, the share price of AT&T ranged between $39.90 and $34.29, and the share price of Verizon ranged from $43.43 to $39.40.

Summary

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis by investigating the extent to which the coefficient of variation and price/earnings (P/E) ratios prior to a public announcement of fraud could be used to predict whether a company was subsequently prosecuted for fraud. Early identification of fraud is critical to minimize the consequences and financial damages associated with fraud. The growth in fraud cases and the ineffective mechanisms present to combat fraud brings forth the need for further research on the issue.

This chapter included a review of literature relevant to evaluating financial statement fraud. First, why and how fraud takes place was discussed; second, the factors contributing to fraud, the preventive measures taken against fraud, and fraud indictors were reviewed; third, a discussion on the efficient market hypothesis and the fraud-on-the-market theory ensued; and fifth, a pilot study that described the relationship of share price to fraud relating to Enron and WorldCom was presented.

According to the literature, financial fraud was and is expected to still be commonplace in American share markets (Hopwood et al., 2012). Recent fraud announcements have indicated a need to identify methods for stockholders to use in making investment decisions based on publicly available data. Part of this need is to evaluate and use financial and accounting theories to address the problem of fraud. Identifying fraud depends on understanding the factors that contribute to fraud. Through understanding these factors, researchers can develop methods to identify and prevent fraud. Such methods may include warning signs that indicate a need to review a company further to determine if fraud is present. Whistleblower policies can help identify fraud through tips from employees, vendors, or customers in a company (McKinney et al., 2011). Fraud is also found using indicators identified through research that external stakeholders can use to make sound decisions. External fraud indicators not only alert stakeholders to proceed with caution but also provide an awareness of potential problems that can result in fraud prevention by discouraging fraud.

A common form of financial statement fraud is insider trading. Insider trading involves individual attempts to profit from private corporate knowledge through the purchase and sale of shares (Kallunki et al., 2009). According to the efficient market

hypothesis, profiting from private corporate information cannot occur in an efficient market because the private information is already reflected in share price (Dunbar & Heller, 2006). Although many arguments exist against the efficient market hypothesis, most researchers agree that some degree of efficiency exists in the market to prevent excessive profits from private information (Milburn, 2008).

Researchers agree on the reasons fraud occurs and also agree that certain indicators can indicate potential fraud problems (Gray et al., 2007; Kaiser & Hogan, 2010). However, a need to identify fraud indicators that can be easily used by external stakeholders remains. Simple factors need to be identified so that members of the investing public can make sound, educated decisions. In addition, these factors and indicators will serve as preventive measures when corporate executives understand that members of the public have the ability to identify manipulations that exist to mislead stakeholders.

The efficient market hypothesis provides a theoretical explanation for the claim that public and private information are reflected in share prices (Ilg, 2010). The fraud-on-the-market theory relies on efficient markets for the identification of the loss incurred from the reliance on share price (Korsmo, 2011). As a result, share price is considered an accurate measure of firm value in an efficient market, and fraud is assumed to be reflected in share price prior to a public announcement of fraud. A research opportunity exists to determine whether or not share prices are indicators of fraud. In Chapter 3, the proposed research method for the current study will be discussed.

Chapter 3: Research Method

Corporate fraud costs an estimated annual $2.9 trillion, which represents 5% of corporate annual revenues (Association of Certified Fraud Examiners, 2010). While methods to identify fraud exist (e.g., examining financial account relationships and differences in horizontal and vertical analyses: Hogan et al., 2008; Kolman, 2007), financial statement fraud still goes largely undetected (Seo et al., 2009). Therefore, additional analytic methods for detecting and potentially predicting fraud would be useful. Benefits to the accurate identification of fraud and/or predicting fraud would greatly reduce both its cost and the frequency of its occurrence. The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. Following is a presentation of the research questions and hypotheses; an elaboration on the research methodology that was used; and a discussion on the target sample and the materials and instruments that were used in the study. Operational definitions of the variables that were used in the analyses were also provided. Finally, a discussion regarding the analytic method and relevant ethical assumptions was presented.

The following research questions and hypotheses guided the proposed study:

Q1. What (if any) is the relationship between the coefficient of variation of share price (calculated as the standard deviation of the share price of the company

divided by the company's average share price) computed over 1 year and the probability of a company being prosecuted for fraud?

Q2. What (if any) is the relationship between the P/E ratio computed over 1 year and the probability that a company was prosecuted for fraud?

The hypotheses tested in this study were as follows:

$H1_0$. There is no statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H1_a$. There is a statistically significant relationship between the coefficient of variation of share price, computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_0$. There is no statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_a$. There is a statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

Research Methods and Design

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently

prosecuted for corporate fraud. An ex post facto, secondary data analysis using a controlled logistic regression was used. The predictor variables for this analysis were as follows: (a) the coefficient of variation of share price (defined as the standard deviation of the company's share price divided by the average share price) and (b) the price/earnings ratio. The control variables used to account for company size were as follows: (a) the percent change in income (defined as the difference in the current year and previous year income divided by the previous year income) and (b) the sales growth rate. Data for all companies included in the study was collected from the COMPUSTAT database. Company identification was performed using the SEC Litigations Releases Report for companies prosecuted for fraud. For companies not prosecuted for fraud, the COMPUSTAT Online database was used to identify companies of similar size and industry to the prosecuted company.

The (dichotomous) criterion variable in this study was defined as fraud category (prosecuted for fraud vs. not prosecuted for fraud) and two predictor variables were entered into a logistic regression equation to determine their ability to predict fraud category. These predictor variables were as follows: (a) the coefficient of variation of share price (defined as the standard deviation of the share price of the company divided by the company's average share price) and (b) the price/earnings ratio. Three variables were used in the study to select companies of similar sizes for the research study: (a) total assets, (b) the change in annual net income, and (b) annual sales growth rate. Because of large differences in company size, the percent change in annual income and the annual sales growth rate were used in the regression model as control variables. Companies were selected to match each company prosecuted for fraud first based on asset level,

followed by annual sales growth rate and change in net income. Total assets were the first matching variable to match companies of similar size. Because fraud occurred at different times in the companies prosecuted for fraud, wide variations occurred in net income. As a result, net income was the final factor reviewed to match companies of similar size.

For this particular research study, a number of alternative analytic methods were reviewed. These included the qualitative method, a mixed methods approach and the quantitative method, in addition to the experimental and discriminant analysis designs. Qualitative analysis is used to *understand* the phenomenon of a problem (Bickman & Rog, 2009). Because this study measured the numerical differences between companies prosecuted for fraud and those not prosecuted for fraud in a controlled, predictive regression framework, the qualitative method was not appropriate. Furthermore, as there are no qualitatively collected variables of interest for this investigation, the mixed methods approach was also not appropriate. An experimental design was also determined to be an inappropriate design as the experimental design is used when the independent variables can be controlled and altered to examine whether a causal relationship exists between key variables (Walliman, 2011). Because this study only investigated the predictive potential of the independent variables, and because variables cannot be explicitly controlled for, the experimental design was also not appropriate. The discriminant analysis was considered for this research study because the design fit the study in that a discriminant analysis uses two or more predictor variables to classify objects or events (Trpkova, & Tevdovski, 2010). Similar to multiple linear regression, discriminant analysis predicts an outcome; however, discriminant analysis predicts

categorical outcomes rather than values (Warner, 2012). Although discriminant analysis was a viable approach, the results would not indicate the strength of each predictor variable in classifying the event (Bunyaminu & Issah, 2012). As a result, a more robust design is preferred. In light of the above, a quantitative, predictive approach was most appropriate as the purpose of the study was to determine whether the predictor variables predicted whether a company was prosecuted for fraud (the criterion variable). Quantitative numerical data are required for logistic regression, which is the only and most appropriate method of analysis given the purpose of the study and the alternatives investigated above (Walliman, 2011).

Ex post facto research examines phenomenon that have already occurred with the hopes of extracting factors that can be used in current research to predict similar occurrences (Jarde, Losilla, & Vives, 2009). As explicated above, a quantitative approach was ideal and because the variables of the study were collected from previously existing data, the ex post facto design was most appropriate. The variables used to evaluate the ability to predict fraud included numeric data measures of firm value. These quantitative measures (the coefficient of variation of share price and P/E ratio) were market-determined measures of the value of a firm. To control for differences in company size, two control variables were used (percentage change in income and sales growth rate). Using quantitative research enabled the identification of patterns of associations and the empirical verification of hypotheses. In this study, the goal was to determine if such relationships existed and, as a result, the quantitative method was most appropriate (Walliman, 2011). Quantitative research was needed in this study to address

a problem that was specific, clear, and precise, enabling high levels of reliability through reliable data gathering and controlled observations (Black, 1999).

For this research study, an ex post facto design was ideal as share price data, from which the coefficients of variation were calculated, cannot be assigned or manipulated. No human participants were involved, and all data was based on records in financial databases. A secondary data analysis was therefore required as secondary data analysis allows a researcher to use data that otherwise would be difficult to collect (Black, 1999). The ex post facto data that was used in this study included share price information for selected companies. Ex post facto research studies are based on data that has already been collected in the past (Jarde, Losilla, & Vives, 2012). These data are then analyzed to determine whether a relationship existed that may be related to present conditions. Logistic regression was used to determine if the study variables could be used to predict whether or not the company was prosecuted for fraud.

Population

No human participants were involved in this study. The population from which data was drawn includes American companies traded in public stock markets, including the New York Stock Exchange (NYSE), the National Association of Securities Dealers Automated Quotations (NASDAQ), and the American Stock Exchange (ASE). All data were based on records in the SEC database and the COMPUSTAT database. Both of these databases are maintained and updated at least weekly with reliable and accurate data (McQuarrie, 2009). The SEC database contains financial filings for all publicly traded companies and any litigation against the companies (Debreceny, Farewell, Piechocki, Gräning, & d'Eri, 2011). The COMPUSTAT database contains financial data

for select companies, including share prices and financial ratios (McQuarrie, 2009). The COMPUSTAT database was used to obtain daily share returns adjusted for dividends and share splits for all shares for the selected companies. Total assets, net earnings and sales growth were also gathered for each company along with the P/E ratio.

The breakdown of the data from 2000 to 2004 is as follows. Between 2000 and 2004, SEC representatives conducted 1,344 administrative proceedings, 1,401 civil actions, and 157 contempt proceedings (U.S. Securities and Exchange Commission, 2012). Of these actions and proceedings, SEC representatives identified and prosecuted 70 US companies for financial or insider trading fraud. Included in this sample were well-known companies whose representatives were proven to have committed fraud, including Enron, WorldCom, AIG, and Lehman Brothers. Excluded from the sample were companies using a foreign currency in the annual report and companies that did not have share price data available due to business closure prior to the fraud prosecution.

The companies listed in the appendix include all publicly traded companies listed in the SEC annual reports for 2000 to 2004 as companies prosecuted for fraud. The significant events for each company were also listed. In cases of insider trading, the company was used instead of the individual charged, to measure any effect on the company from the announcement of insider trading. In three cases, the companies listed in the annual report reference allegations made the previous year, but prosecuted in the current year. As a result, McKesson HBOC, ABS Industries, Inc. and Keefe, Bruyette, & Woods, Inc. were included in the research even though the allegations were made in 1999.

Sample

Data was collected from www.sec.gov. The SEC Litigations Releases Reports from 2000 – 2004 were utilized. A convenience sample of all companies listed in these reports that were prosecuted by the SEC for financial fraud or insider trading and that have data available was used. For cases of insider trading, the company was used rather than the individual because it was the company stock that might have been affected. This methodology was used to develop the appendix, the population for the study. To control for company differences, rather than searching for control companies (similar companies in terms of income), the variables for percent change in income and sales growth rates were included in the analysis. The percentage change in income was defined as the annual percentage change in income from the previous year and sales growth rates were the annual percentage change in sales. As a result, the same number of companies not prosecuted for fraud was selected based on company size (using total assets). Because of large differences in company size, the regression used control variables (percent change in income and sales growth rate).

The sample size for the study was 139 companies (70 prosecuted for fraud, 69 not prosecuted for fraud). A single company (Manahagar Tel Nigam) that was not prosecuted for fraud was omitted from the analyses due to missing data. Therefore, of the 16 companies in the analysis within the same SIC code, Compuware was duplicated in the analysis as the alternate "match" since it most closely matched the time frame of the company pair. A power analysis was conducted using G*Power software (Faul et al., 2009) to determine the power of the test, assuming a multiple logistic regression analysis

with a medium effect size $f = 0.15$ and an alpha significance level of 0.05. With 139 companies and two predictor variables, the computed power of the test was 98.81%.

Materials/Instruments

This study did not involve the creation or use of instruments such as surveys. The variables required for the analysis all came from previously constructed datasets and included: whether a company was prosecuted for fraud (criterion variable), the coefficient of variation of share price (predictor variable), the P/E ratio (predictor variable), annual net income (control variable), and sales growth rate (control variable). Data used in the study was extracted in the process detailed above from the COMPUSTAT database and then uploaded into SPSS. All data used in the research study were public domain and permission was not needed to conduct the study.

Operational Definition of Variables

In this study, two independent predictor variables were used along with two control variables: coefficient of variation of share price (predictor variable), the P/E ratio (predictor variable), average net income (control variable), and sales growth rate (control variable). These variables were used to determine whether a predictive model could be constructed with statistical significance. A definition for the independent predictor variables, the criterion variable, and the control variables follow.

Coefficient of variation. For the purposes of this study, and for clarity, the coefficient of variation was used in place of the Sharpe Ratio (Scholz, 2007). Typically, the coefficient of variation is the standard deviation of a distribution divided by the mean; however, because in this study the researcher sought to use the purpose of the coefficient, calculated similarly to the Sharpe Ratio, the researcher utilized the coefficient of

variation as the terminology for the following calculation: the coefficient of variation was defined as the standard deviation of the share price of that company divided by average share price of the given company over the one year period prior to the company being prosecuted for fraud (Scholz, 2007). Daily price data was obtained from the COMPUSTAT database and from these data the returns and standard deviations of the returns were calculated. The coefficient of variation measured the dispersion of the standardized share price as a ratio variable. The resulting measure was multiplied by 100 to obtain a percent. The range of the coefficient of variation was between 0% and 100%. A higher coefficient of variation meant that the share price had a greater dispersion around the mean, and thus, a more volatile share price. Likewise, a lower coefficient of variation indicated that the share price had a lower dispersion around the mean price. The coefficient of variation was the predictor variable for Research Question (Q1).

Price/earnings (P/E) ratio. Price/earnings (P/E) ratio (X_3) was a ratio level predictor variable. The price/earnings (P/E) ratio was already in a standard ratio form and therefore did not need to be computed in terms of the S&P 500 value. To compute the P/E ratio, the average share price over the evaluation period of the year prior to the prosecution for fraud was divided by the average of the company's earnings from the same previous 10K annual reports immediately prior to the fraud announcement date. In other words, the average share price was divided by the average corporate earnings over the same period. The P/E ratio was an indicator of the multiple of earnings that would be needed to meet the current market price of the stock (Saleh & Bitar, 2012). Another purpose of the P/E ratio was to provide a method of differentiating between value and growth firms. Value firms are usually stable businesses with low P/E ratios and growth

firms are usually growing businesses or businesses with risky, but potentially high value, business models (Smith, 2011). The average share price over the evaluation period was obtained from the COMPUSTAT database. The P/E ratio can range from 0 to infinity. The higher the P/E ratio, the more expensive the company shares are relative to other companies. Likewise, a lower P/E ratio indicates the company was priced lower based on the return. P/E ratio was the predictor variable for Research Question (Q2).

Fraud status. Fraud status was used as a dichotomous outcome variable (Y) categorized as *not prosecuted for fraud* (0) and *prosecuted for fraud* (1). The source of this information was the SEC fraud database. Companies prosecuted for fraud were listed in the SEC Significant Enforcement Actions section of each SEC annual report. Furthermore, the SEC must have prosecuted the company for financial statement fraud or insider trading fraud. Fraud status was the outcome variable for all research questions. The fraud status was determined using logistic regression to create a model. The model (equation) included the predictor variables identified above to predict the response variable. This outcome variable classified the companies as prosecuted for fraud or not prosecuted for fraud (fraud status).

Percent change in income. Percent change in income was used as a control variable to standardize the companies of different sizes (Spector & Brannick, 2011). The source of this information was the COMPUSTAT database. The percent change in income was calculated by dividing the difference in the current and prior year income amounts by the prior year income (Aras, Aybars, & Kutlu, 2010). The model (equation) did include control variables to standardize each selected company for size. The percent change in income is a ratio variable than can range from -100% to 100%.

Sales growth rate. The sales growth rate was used as a control variable to standardize the companies of different sizes (Spector & Brannick, 2011). The source of this information was the COMPUSTAT database. The sales growth rate was calculated by dividing the difference of the current annualized sales and the prior period annualized sales by the prior period annualized sales (Ishikawa, 2010). The model (equation) included this control variable to standardize each selected company for size. Sales growth rate is a ratio variable that can range from -100% to 100%.

Data Collection, Processing, and Analysis

Data collection. Data was used from companies on file with the SEC between 2000 and 2004. This time period was selected because numerous cases of fraud were discovered during and after the economic period ending in 2001, in which many corporate share prices were considerably higher than the intrinsic value (Gottschalk & Solli-Sæther, 2011). For this period, 70 financial fraud and insider trading cases were identified (see Appendix). An equal number of companies not prosecuted for fraud were selected (however, one company had missing data, resulting in 69 companies not prosecuted for fraud), the total sample size was 139, giving a 98.81% power to the study using G*Power software (Faul et al., 2009). For companies prosecuted for fraud, data was examined for a period of one year prior to the fraud announcement. The one year time frame was selected because the average fraud lasts 18 months prior to detection, and it is the end of this time period (the last six to 12 months) that individuals within the organization or outsiders close to the organization suspect or have knowledge of the fraud and leak the fraud externally (Association of Certified Fraud Examiners, 2012). The 12 months prior to the fraud included an annual report with earnings announced during the

fraud and include enough time for the effect of any information leaks to be reflected in the share price. Each company prosecuted for fraud was matched with one company not prosecuted for fraud. Data from the same time period was used for the company prosecuted for fraud and the comparable company not prosecuted for fraud. The match was based on size and SIC code. Matching was based on fraud prosecution as well as total assets, sales growth rate and income levels. Following data collection, a descriptive analysis of the companies was included in the results section for the purpose of assessing whether any statistically significant differences between the prosecuted and not prosecuted companies with respect to these variables existed.

According to the National Association of Securities Dealers Automated Quotation (NASDAQ) system, the population of US companies listed on the NASDAQ (2,365), NYSE (2,141), and AMEX (387) exchanges equal a total population of 4,893 US publicly traded companies (NASDAQ, 2012). Prices during the same time period were examined for each set of two companies. The outcome of the study provided a means of testing the efficient market hypothesis and confirmed whether stock prices reflect private corporate information.

Data processing. The data was entered into SPSS (version 18) statistical software for analysis. The following values were calculated: (a) the coefficient of variation of share price, (b) the price/earnings ratio for each company, (c) the percent change in income, and (d) the growth rate. The criterion variable was coded as a categorical variable and given a code of one where a company was prosecuted for fraud and a zero where the company was not prosecuted for fraud.

The coefficient of variation of share price was calculated as follows: the one-year average daily share price for the company was calculated. The standard deviation of the company's share price over that period was also calculated. Finally, the standard deviation of the company's share price was divided by the average daily share price.

The price/earnings (P/E) ratio for each company was calculated by dividing the average share price for the year prior to the fraud announcement by the most recently published company income. The most recent income was obtained from the annual report published within the year of the share price study for each company. The price to earnings ratio was also limited to the years of the study.

Data analysis. Because of differences in company size, control variables (percent change in income and sales growth rate) were included within the regression equation. Although it is desired to have companies of the same approximate size, in some cases, this was not possible because some companies dominate an industry. Thus, the data was analyzed using a controlled logistic regression. Logistic regression is utilized when the dependent variable represents two outcomes, one in which an event happens and one in which an event does not happen (Walliman, 2011). In this case, the event was whether or not a company was prosecuted for fraud. The logit curve, which was used as a substitute for the traditional linear usage of the Generalized Linear Modeling procedure, limited the outcomes of the regression equation to between zero and one, which translated the regression equation to a probability. As a result, the regression equation allowed for the prediction of a probability of an event occurring given specific predictor variables. Thus, the logistic regression allowed for the determination of

whether the independent variables of the study were significant predictors of the probability of being prosecuted for fraud.

The logistic regression used all predictor variables in the equation. The relevant statistical assumptions for logistic regression were as follows: (a) the predictor variables were measured without error, (b) the observations were independent, and (c) the variables were not linear combinations of each other (Agresti, 2012). The first assumption was met as a result of the known and cited accuracy of COMPUSTAT data. The independence of the observations had already been studied. Smith (2011) stated that when conducting accounting and financial analysis, companies found to have a given fraud, unless contractually linked to another fraudulent company, should be treated as an independent observation. Finally, the statistical software SPSS returns the error that a regression equation is not estimable if the variables are a linear combination of each other.

The controlled regression allowed the results to be evaluated on an individual basis. This meant that the impact of each predictor variable was analyzed on a *ceteris parabis* basis (Smith, 2011). In other words, the effect of a change in the P/E ratio with respect to the probability of a company being prosecuted for fraud was analyzed given the changes in the other predictor and control variables. In this way, the impact of the P/E on the probability of a company being prosecuted for fraud could be isolated. The following will provide a technical discussion of the quantitative methodology associated with logistic regression. The regression equation was as follows:

$$\Pr(Y_i|X1_i, X2_i) = p_i Y^i * (1 - p_i)^{(1-Y_i)} \qquad (1)$$

where Pr was the probability that the probability distribution of Y_i (prosecution for fraud as a dichotomous variable) was equal to the probability mass function given the Bernoulli

distribution, specifying the probability of witnessing one of the possible two outcomes (Agresti, 2012). In other words, the regression equation uses the two independent, or predictor, variables (in this case these will be the coefficient of variation of share price and the price/earnings ratio) to identify the probability that the company was either prosecuted for fraud or not prosecuted for fraud. This is simplified to the logistic regression general equation (Menard, 2011):

$$logit(\mathbb{E}[Y_i|X_i]) = logit(p_i) = \ln\left(\frac{P_i}{1-P_i}\right) = \beta * X_i \qquad (2)$$

where E[..] is the expected value of the criterion variable given the values of the predictor variables. The standard regression equation of $B * X_i$ was the result of applying the logit function for which the logistic regression was named (Agresti, 2012). Thus, according to the logistic regression general equation, the criterion variable was specified by category (prosecuted for fraud or not prosecuted for fraud) based on the relationship identified between the predictor variables and the indication of fraud in the regression equation (Black, 1999). The familiar $B * X_i$ was the standard regression formula of:

$$f(i) = B_0 + B_1 * x_1 + B_2 * x_2 + e \qquad (3)$$

where χ_1 was the coefficient of variation (the standard deviation of the company's share price divided by the average share price for the 12 months prior to the fraud announcement date), x_2 was the P/E ratio, and e is distributed as a Logistic (0,1). The first hypothesis would be rejected if the parameter estimate B_1 is statistically significant at the .05 level. The second hypothesis would be rejected if the parameter estimate B_2 is statistically significant at the .05 level.

The hypotheses to be tested were as follows:

$H1_0$. There is no statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H1_a$. There is a statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_0$. There is no statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_a$. There is a statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

The analysis that was used to test these hypotheses was logistic regression. Because one model was used, the test was the statistical significance of the parameter estimates. If predictor variables, as noted in the above hypotheses, were statistically significant at the .05 level of significance, then the null hypothesis would be rejected (Tonidandel & LeBreton, 2011).

Assumptions

Thus far, this chapter has consisted of a presentation of the research questions, hypotheses, research design, data collection procedures, and analytic methods. In this section, the methodological assumptions, limitations, and delimitations will be discussed. A discussion on ethical assurances will follow.

The data used in this study was obtained from the COMPUSTAT database and the SEC Litigations Releases Report. The primary assumption for the study data was that the COMPUSTAT database provided unbiased share price data that was equally available for all companies and that the SEC Litigations Releases Report accurately reports companies litigated for fraud by the SEC. The COMPUSTAT database, however, did not include data on all companies since it did not provide data for companies prior to 1973 (McQuarrie, 2009). Because this study examined only companies in existence from 2000-2004, the failure of this assumption did not have an effect on the analysis. Further, in the study to examine share price fluctuations in relation to the efficient market hypothesis, only the daily share price was used and not the rates of return. Thus, the assumption is that the COMPUSTAT database reflected accurate daily share prices for the companies selected for the study. Likewise, the SEC database was also assumed to accurately reflect the companies prosecuted for fraud in addition to the dates that the litigation commenced. Additionally, it was assumed that the commencement date of litigation was the first public announcement date of corporate fraud.

An additional assumption was that the time frame selected for this study, 2000-2004, was representative of the frequency and different types of financial fraud. This time frame was selected because of the known occurrence of fraud in large, well-known companies including Enron and WorldCom (Rockness & Rockness, 2005). While there were other fraud cases that happened prior to or following this time period, this period represented a change in accounting practices and thus is ideal for this study.

Limitations

Aside from the research assumptions, a number of limitations existed that must be discussed. The design of the study was ex post facto, and cause and effect could not be demonstrated (Black, 1999). Uncontrolled mediating variables existed within the economic and industrial environments for all companies studied. These variables included issues unrelated to fraud as well as situations that caused share price fluctuations, such as economic events, industry wide legislation, natural disasters, and earnings releases (Cram, Karan, & Stuart, 2009). To address economic, political, and environmental effects, companies not prosecuted for fraud within the same industry as the company prosecuted for fraud were included in the study to identify expected share price fluctuations for companies experiencing the non-fraud related events (Stádník, 2011).

One weakness of archival data designs is that data may not be consistent across all cases researched (Black, 1999; Smith, 2011). Some financial items, such as cost calculations, may be calculated differently in different companies. However, share price is market-driven and was therefore evaluated according to consistent standards.

Another limitation of this study was that the methodology applies only to publicly listed companies (Barakat & Terry, 2010). As a result, conclusions were generalizable only to other companies listed publicly on U.S. stock exchanges. Conclusions were not generalizable to all firms. The reason for this is that not all firms have publicly traded share prices. Since the main predictor variables depended on the share price, companies that did not have share prices could not be included.

One limitation of the model used for this study is that unfavorable collinearity between predictor variables produces unreliable results. Unfavorable collinearity is a high degree of correlation between the independent, or predictor, variables (Tonidandel & LeBreton, 2011). While there was no irrefutable test for multicollinearity, the correlations among the variables was checked along with the standard errors to ensure they were within reasonable bounds (Tonidandel & LeBreton, 2011). This would be the case if, for instance, the coefficients of variation of share price were to be highly correlated with the P/E ratio, sales growth, or income. In this research study, multicollinearity did not exist because the coefficient of variation normalized share price changes by their standard deviation.

Type I error is defined as rejecting a correct hypothesis and Type II error is defined as failing to reject an incorrect hypothesis (Tonidandel & LeBreton, 2011). Certain costs are involved when Type I and Type II errors are made (Duffy, 2010). Type I errors may incur the larger cost of not predicting fraud when in fact fraud occurs. To decrease the probability of a Type I error, the control variables of income and sales growth were added to the logistic regression model. Although the occurrence of a Type II error would not be as costly as a Type I error, the costs involved in foregone investments and in research to identify fraud create financial expense and opportunity costs. The Type II error may also require additional cases to increase the power of the test. Increasing the number of variables, on the other hand, would create a more complex function that may become too complicated to be useful for a stakeholder and would increase the possibility of a Type II error.

Delimitations

In addition to limitations, delimitations in this study also existed to ensure the scope is reasonable. Delimitations can be defined as factors that limit the scope of the research (Bickman & Rog, 2009). As this relates to this study the following delimitations apply; the time frame, the number of companies, and the number of predictive variables. First, the time frame used for the study, 2000 to 2004, reviewed five years for companies prosecuted for fraud to ensure data retrieval and analysis is possible. Limiting the time frame allowed a timely data analysis with a scope small enough to ensure accuracy. In this study, 139 companies were used: 70 companies prosecuted for fraud, and 69 companies not prosecuted for fraud. Although the 70 companies prosecuted for fraud represented the entire population, the companies not prosecuted for fraud were not representative of the population. Without expanding the study period, additional companies prosecuted for fraud do not exist. Finally, only two predictor variables were used in this study. These variables were selected based on the use of share price data. Additional predictor variables do exist; however, this study limited the variables to those that most closely reflected share price and the changes in share price in relation to the announcement of fraud.

Ethical Assurances

Before data was collected, approval from the Institutional Review Board (IRB) at Northcentral University was sought. There were four categories of ethical issues in research including protection from harm, informed consent, right to privacy, and honesty with professional colleagues (Black, 1999). This study did not include human participants and therefore the concerns regarding ethical assurances did not apply. The

only ethical concern that may have related to this study was data confidentiality; however, since all data were publicly available, and not linked to an individual person, this concern did not apply. Steps were taken to overcome ethical concerns regarding the use of secondary data. Reasonable care was exercised in ensuring the accuracy and the quality of the data selected. An industry-accepted database, COMPUSTAT, was used to obtain the share price data, and the SEC Litigations Releases Report was used to select the companies prosecuted for fraud. Attempts were made to avoid careless errors, examine and check all data used, and report the results accurately. The data used in this research study were public domain and therefore informed consent and permission to use the data was not required. Furthermore, privacy concerns were alleviated given the public domain status of the data.

This research study qualified for an expedited IRB review because the research did not use human participants, was conducted in an educational setting, and was not classified. Additionally, this research was ex post facto and used companies already prosecuted for fraud. Because the companies used in this research study had already been prosecuted for fraud (which is public domain), a risk did not exist for criminal or civil liability as a result of the research findings. IRB approval was obtained prior to obtaining the data and conducting the statistical analysis.

Summary

The purpose of this quantitative study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios

prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The literature reviewed indicated that financial fraud is a regularly occurring event (Anderson & Tirrell, 2004; Benediksdottir et al., 2011; Bota-Avram, 2008; Hopwood et al., 2012). Common forms of fraud include insider trading and financial statement fraud. The strong-form of the efficient market hypothesis states that these methods of fraud should be taken into account by a company's share price (Dunbar & Heller, 2006). Methods are available to detect fraud; however, there remains a need for methods of detecting fraud that can be used by external stakeholders. As a result, this study will determine whether a predictive relationship exists between the independent (predictor) and dependent (criterion) variables.

The predictor variables were the coefficient of variation of share price and the P/E ratio. The control variables were a company's annual income and sales growth rates. An ex post facto, secondary data analysis was used. The archival data used in the study was extracted from the SEC corporate fraud database and from the COMPUSTAT share price database. For each company selected, a company was matched with the same SIC code and approximately the same sales growth rate and income level. Data for all companies was obtained from the COMPUSTAT database, and data for the companies prosecuted for fraud came from the SEC Litigations Releases Report. The data were analyzed to identify whether or not the coefficient of variation (the average corporate share price divided by the standard deviation of the corporate share prices) and P/E ratios prior to a public announcement of fraud predicted prosecuted corporate fraud. Since the criterion variable was binary, a controlled logistic regression was used.

Chapter 4: Findings

The objective of this quantitative research study was to test the efficient market hypothesis by determining the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was prosecuted for corporate fraud. Secondary data was obtained from the COMPUSTAT database for the period of 2000 through 2004 to meet the study's objective. It was during 2000 to 2004 that numerous cases of fraud were discovered as a result of the economic period ending in 2001.

The study variables obtained from the database included the independent or predictor variables (the coefficient of variation of share price and P/E ratio); the criterion variable (prosecution [for fraud] status); and two control variables (percentile change in income and the sales growth rate). The control variables were included in order to account for company size and to control its influence on the relationship that existed between the predictor variables and the probability of whether a company was prosecuted for fraud over the selected period. The ability of the two independent/predictor variables to differentiate between companies prosecuted and not prosecuted fraud was examined.

The sample consisted of 139 American companies, of which 70 were convicted of fraud between 2000 and 2004, and 69 that were not prosecuted for fraud during the same time period. A single company (Manahagar Tel Nigam) that was not prosecuted for fraud was omitted from the analyses due to missing data. As a result, of the 16 companies in the analysis within the same SIC code, Compuware was duplicated in the analysis as the alternate "match" since it most closely matched the time frame of the company pair. Statistical analyses of the data were conducted using a logistic regression

model to investigate whether the coefficient of variation of share price and P/E ratio could predict the dichotomous criterion variable of whether or not a company was prosecuted for corporate fraud. Logistic regression was justifiable, since the data of the dependent (criterion) variable is a categorical and dichotomous variable, while the predictor variables and control variables were continuous variables measured either as interval or ratio. The value of a continuous variable is not limited to a certain range, but continuous within a certain interval. Two research questions and hypotheses were formulated to guide the analysis. These were as follows:

RQ1: What is the relationship (if any) between the coefficient of variation of share price (calculated as the standard deviation of the share price divided by the average share price of the company) computed over one year and the probability of a company being prosecuted for fraud?

$H1_0$: There is no statistically significant relationship between the coefficient of variation of share price computed over one year and the probability of a company being prosecuted for fraud.

$H1_a$: There is a statistically significant relationship between the coefficient of variation of share price computed over one year and the probability of a company being prosecuted for fraud.

RQ2: What is the relationship (if any) between the P/E ratio, computed over one year and the probability that a company was prosecuted for fraud?

$H2_0$: There is no statistically significant relationship between the price to earnings ratio computed over one year and the probability of a company being prosecuted for fraud.

$H2_a$: There is a statistically significant relationship between the price to earnings ratio computed over one year and the probability of a company being prosecuted for fraud.

In this chapter descriptive statistics of the study variables and the means and standard deviations for the coefficient of variation of share price, the P/E ratio, percentile of change in income, and the sales growth rate of companies that were prosecuted for fraud and those that were not are presented. Following the descriptive statistics, a Pearson's correlation test was conducted between the two predictor variables (i.e., coefficient of variation of share price and the P/E ratio) to determine if a significant relationship existed between the two variables. After it was established that there was a low correlation between the predictor variables, a logistic regression was run to determine if changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was prosecuted for corporate fraud. The results from these analyses are presented and discussed below.

Results

Descriptive statistics analysis of study variables. Descriptive statistics are necessary in statistical research to explain and summarize the data and to describe the sample characteristics (Marshall & Jonker, 2010). Descriptive analyses were conducted to make comparisons of the percentile change in income, sales growth rate, coefficient of variation of share price, and P/E ratio between the companies that were prosecuted for fraud and companies that were not prosecuted for fraud. Table 3 summarizes the descriptive statistics (mean and standard deviations) of the predictor and criterion

variables and also shows the average price and standard deviation of the company's stock.

Table 3

Descriptive Statistics of Percentile Change in Income, Sales Growth Rate, Coefficient of Variation, and P/E Ratio by Companies' Prosecution for Fraud

		Percent change in income	Sales Growth Rate	Average Price	SD	CV	P/E ratio
Not Prosecuted for fraud	M	32.77%	13.92%	112.74	9.16	21.26%	1.33
	N	69	69	69	69	69	69
	SD	365.09	29.01	769.00	42.72	18.25%	8.43
Prosecuted for fraud	M	25.79%	14.06%	56.37	16.17	31.37%	-8.82
	N	70	70	70	70	70	70
	SD	489.94	33.24	161.38	75.03	35.89%	68.81
Total	M	29.23	13.99	84.15	12.71	26.38%	-3.78
	N	139	139	139	139	139	139
	SD	431.39	31.12	550.65	61.16	28.94%	49.28

Mean comparisons were conducted to determine whether or not the companies prosecuted for fraud or the companies not prosecuted for fraud had better performance in each of the study variables (percentile change in income, sales growth rate, coefficient of variation of share price, and P/E ratio). While mean differences were observed in change in income, sales growth rate, average share price, standard deviation, coefficient of variation, and P/E ratio between companies prosecuted versus those not prosecuted for fraud, a series of t-tests demonstrated that there was not a significant difference between change in income for companies prosecuted for fraud and companies not prosecuted for fraud $t(130) = .10, p > .05$; between the sales growth rate for companies prosecuted for fraud and companies not prosecuted for fraud $t(136) = -.03, p > .05$; between the mean share prices for companies prosecuted for fraud and not prosecuted for fraud $t(74) = .60$, $p>.05$; between the means of standard deviation for companies prosecuted for fraud and

those not prosecuted for fraud $t(112) = 0.68, p > .05$; between the means of coefficient of variation for companies prosecuted for fraud and the companies not prosecuted for fraud $t(123) = .98, p > .05$; and the difference between the means of P/E ratio for companies prosecuted for fraud and the companies not prosecuted for fraud $t(72) = 1.23, p > .05$. Because each variable was not significantly independent for companies prosecuted for fraud and companies not prosecuted for fraud, it was important to identify whether or not the variables in combination resulted in significant differences.

Pearson's correlation test results. A Pearson's correlation coefficient was calculated to determine the correlation between the predictor variables coefficient of variation of share price and P/E ratio to investigate the possibility of unfavorable multicollinearity or high degree of correlation between the independent (or predictor) variables (Menard, 2011). Unfavorable multicollinearity should not exist between predictor variables when conducting a logistic regression as this would suggest that the two predictor variables will be redundant in predicting the criterion variable (Bickman & Rog, 2009). The Pearson product-moment correlation test is used when both variables are at least interval and the data is parametric (Field, 2009). Such statistical testing was needed to determine whether or not a low or non-existent correlation existed between the predictor variables before a logistic regression can be used. The Statistical Package for the Social Sciences (SPSS) generates bivariate correlation coefficients. These coefficients can be used to determine the presence and the strength of any significant connections among a study's variables and are summarized in a single number: the Pearson product-moment correlation coefficient (r coefficient; Menard, 2011). The direction and the degree of any association must be deduced to correctly interpret the

meaning of any observed association among coefficient scores in a correlation matrix. A positive correlation is identified if the coefficient is positive, while a negative correlation would exist if the correlation coefficient is negative (Ratner, 2009). The strength of the relationship is determined through the *r* coefficient. According to Cohen (1988), an *r* coefficient = 0.1 can generally be considered a small effect, 0.3 can generally be considered a medium effect, and 0.5 can generally be considered a large effect.

The results from the Pearson's correlation coefficient calculations indicate that the coefficient of variation and P/E ratio were not significantly correlated (r [139] = 0.05, p = .53). The p-value of statistical significance of the Pearson's correlation value exceeds that $p < .05$ which means that there is no sufficient statistical evidence to ascertain that a significant correlation exists between the two variables (Bickman & Rog, 2009). Thus, unfavorable multicollinearity between the two predictor variables of coefficient of variation of share price and P/E ratio was not present. With such results, the logistic regression can be conducted, since the required assumption was not violated by the study variables (Menard, 2011).

Logistic regression results and analysis. A series of three logistical regression models were created to determine the extent to which the coefficient of variation and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. Specifically, a hierarchical method was used in which control variables of percentile change in income and sales growth rate were entered in the analysis before the predictors of the effects, which are of primary concern (van der Heijden, 2012). Multiple models were created in order to first test the individual effects of the control variables to the criterion variable and then to test

the predictive relationship that existed between the predictor variables and the probability of whether a company was prosecuted for fraud over the selected period while controlling the impact of the control variables to the relationship between the predictor variables and criterion variable (Farraway, 2002). Again, the control variables were included in order to account for company size and to control its influence on the relationship that existed between the predictor variables and the probability of whether a company was prosecuted for fraud over the selected period. A level of significance of 0.05 was used in the hypothesis testing (Black, 1999). Below, detailed information regarding the analyses performed and results identified are provided.

The case-processing summary of the overall logistic regression model is summarized in Table 4. The ratio of the valid cases to predictor variables for logistic regression is displayed in this table. The minimum ratio of valid cases (n) to predictor variables for logistic regression should be 10 to one, and the preferred ratio should be 20 to one (McCormick, Raftery, Madigan, & Burd, 2012). The generated logistic regression model had 139 valid cases and four predictor variables (two predictor; two control variables). The ratio of cases to the predictor variables was 34.75 to 1. The ratio satisfied the minimum requirement, while also satisfying the preferred ratio of 20 to 1. Therefore, the logistic regression can be conducted since the minimum ratio of valid cases was satisfied. The minimum number of ratio of valid cases should be satisfied in order to eliminate the over-fitting of the estimates to the data, which will cause lack of generalizability and inflated error rates (Bobko & Schemmer, 1984).

Table 4

Case Processing Summary of the Overall Logistic Regression Model

Unweighted Cases[a]		*N*	Percent
Selected Cases	Included in Analysis	139	99.3
	Missing Cases	1	.7
	Total	140	100.0
Unselected Cases		0	.0
Total		140	100.0

[a]If weight is in effect, see classification table for the total number of cases.

The first model generated was a null model, which did not include predictors or the control or predictor variables. This model was generated to provide a baseline to compare predictor models (Hilbe, 2009). The statistics for the equations of the logistic regression for the null model only included the constant of the regression model. The result of the statistics for the equation of the logistic regression for the null model, which only included the constant of the regression model, showed that the constant was insignificant (Wald [1] = 0.01, p = .93), because the probability value was greater than 0.05. This means that the Wald chi-square test did not result in rejection of the null hypothesis for the null model that the constant equals zero. This model was used to determine whether or not the predictor variables could improve the null model. Because the null model was zero, this shows that the prediction of fraud within the model does not exceed the accuracy rate of a random guess. Thus, further models including the predictor variables were run to improve the model to become a more accurate predictor of companies prosecuted for fraud. These models are summarized below.

Table 5 summarizes the statistics for the equations of the variables not included in the null model. These were the control variables of percentile change in income (Score [1] = 0.01, p = .93) and sales growth rate (Score [1] = 0.004, p = .95). The probability

value of the overall statistics of the regression model, not including the two control variables, was insignificant (Score[(1] = 0.014, p = .99), implying that the control variables did not have any significance to the criterion variable once they were included in the model. Thus, the final model was run both with and without the control variables to ensure a difference between the two models did not exist, thus confirming the insignificance of the control variables.

Table 5

Variables not in the Equation for Null Model

			Score	Df	Sig.
Step 0	Variables	Percentile change in income	.01	1	.93
		Sales Growth Rate	.004	1	.95
	Overall Statistics		.014	2	.99

The second model generated was the block one logistic regression model and included the entry of control variables. The predictor variables were not yet included in the second model. The purpose of the second model was to determine whether any of the control variables of percentile change in income and sales growth rate significantly influenced the criterion variable when included in the model. The results of the overall test for the second model including the control variables are summarized in Table 6. The chi-square test was conducted to test the model to determine the existence of a significant relationship between the control variables and the criterion variable. The probability value of the chi-square test (χ^2 [2] = 0.14, p = .99) was greater than .05 indicating that the model was insignificant. The results suggested that neither of the two control variables had any significant influence or association to the criterion variable.

Table 6

Omnibus Tests of Model Coefficients for Logistic Regression with Control Variables

		Chi-square	Df	Sig.
Step 1	Step	.014	2	.99
	Block	.014	2	.99
	Model	.014	2	.99

The third model generated was the block two logistic regression model, where both the control variables and predictor variables were included in the regression model to determine whether the model supported the null hypothesis that there was no difference between the model without predictor variables and the model with predictor variables. Statistical significance would mean the existence of a relationship between the predictor variables and the criterion variable. The presence of a relationship between the criterion variable and combination of predictor variables entered after the control variables was investigated.

The first statistic investigated for the full logistic regression was the overall test of the model fit. The overall model fit of the full logistic regression was tested through the investigation of the block chi-square for the second block of variables in which the predictor independent variables were included (van der Heijden, 2012). The result is summarized in Table 7. The probability value of the block chi-square test (χ^2 [2] = 9.19, p = .01) had a value less than the level of significance value of 0.05. The null hypothesis stating that there is no difference between the model with only a constant and the control variables versus the model with the predictor independent variables was rejected (Farraway, 2002). This indicated a significant relationship between the predictor independent variables and the criterion variable (Ando & Tsay, 2011).

Table 7

Omnibus Tests of Model Coefficients for Controlled Logistic Regression with Predictor Variables

		Chi-square	Df	Sig.
Step 1	Step	9.19	2	.01*
	Block	9.19	2	.01*
	Model	9.21	4	.06

*$p < .05$.

Table 8 summarizes the accuracy rate for the controlled logistic regression involving the predictor variables. The overall percentage of the classification accuracy rate should be 25% or higher than the proportional by chance accuracy rate. The accuracy rate computed by SPSS was 59.7%. On the other hand, the proportional by chance accuracy rate was computed by calculating the proportion of cases for each group, based on the number of cases in each group in the classification table shown in Table 9. This was computed by squaring and summing the proportion of cases in each group ($49.6\%^2 + 50.4\%^2 = 50.00\%$). The accuracy rate computed of 59.7% was greater than or equal to the proportional by chance accuracy criteria of 50%. Thus, the criterion for classification accuracy was satisfied.

Table 8

Classification Accuracy Rate for Controlled Logistic Regression with Predictor Variables

			Predicted		
			Prosecution for fraud		Percentage
	Observed		0	1	Correct
Step 1	Prosecution for fraud	Not prosecuted for fraud (0)	52	17	75.4
		Prosecuted for fraud (1)	39	31	44.3
	Overall percentage				59.7

Note. The cut value is .500.

Table 9

Classification Table for Logistic Regression

			Predicted		
			Prosecution for fraud		Percentage
	Observed		0	1	correct
Step 0	Prosecution for fraud	Not Prosecuted for fraud (0)	0	69	.0
		Prosecuted for fraud (1)	0	70	100.0
	Overall percentage				50.4

Note. Constant is included in the model. The cut value is .500

Table 10 summarizes the coefficient of the variables in the equation of the controlled logistic regression. The analysis of this statistic determined the influence of the predictor variables of coefficient of variation of share price and P/E ratio to the criterion variable of prosecution for fraud, while controlling the impact of the two control variables. The coefficients, standard errors, the Wald test statistic with associated degrees of freedom, *p*-values, as well as the exponentiated coefficient (also known as an odds ratio) are enumerated in Table 10. The relationship between the predictor and the criterion variables will be stronger when the deviation of the odds is farther from one

(Franke & Osius, 2013). A level of significance of .05 was used in the statistical testing. Statistical significance of the statistics would mean the rejection of the null hypothesis, which stated that there is no statistically significant relationship between the coefficient of variation of share price and price to earnings ratio, computed over one year, and the probability of a company being prosecuted for fraud using a controlled logistic regression (McCullagh & Nelder, 1989). This would suggest that there was a statistically significant relationship between the independent, or predictor, variables and dependent, or criterion variable (McCormick et al., 2012).

The result showed that the Wald statistic for the two control variables of percentile change in income (Wald [1] = 0.02, p = .89) and sales growth rate (Wald [1] = 0.65, p = .42) were insignificant, since the probability values were greater than 0.05. This suggests that the influence of both control variables was controlled in the model, since the control variables were not significantly related to the dependent, or criterion variable (van der Heijden, 2012). Also, the Wald statistic of the constant (Wald [1] = 0.01, p = .93) of the logistic regression was insignificant. For the predictor variables, the statistics showed that the predictor variable of coefficient of variation (Wald [1] = 4.6, p = .03) significantly influenced the criterion variable of prosecution for fraud, as the Wald statistic was less than the level of significance value. The statistic resulted in the rejection of null hypothesis for research question one. Alternatively, it supported the alternative hypothesis, which stated that there is a statistically significant relationship between the coefficient of variation of share price, computed over one year, and the probability of a company being prosecuted for fraud using a controlled logistic regression. However, it was determined that the P/E ratio (Wald [1] = 0.99, p = .32) did

not significantly influence the criterion variable of prosecution for fraud, as the Wald statistic was greater than the level of significance value. The statistics did not result in the rejection of the null hypothesis for research question two. The results showed that there was no statistically significant relationship between the P/E ratio, computed over one year, and the probability of a company being prosecuted for fraud using a controlled logistic regression (Farraway, 2002). As a result, the insignificance of the P/E ratio further supports the idea that share prices accurately reflect the intrinsic value in the daily closing price. Thus, it was only determined that fraud was reflected in the coefficient of variation. The coefficient of variation of share price was a reliable indicator of fraud. The strong-form efficient market hypothesis was confirmed, based on the coefficient of variation.

The coefficient of the odd ratio statistic of Exp(B) of the significant predictor variable of coefficient of variation of share price was investigated to determine change in the log odds of the criterion variable for a one unit increase in the coefficient of variation (McCullagh & Nelder, 1989). The Exp(B) coefficient was 1.02, which implies that a one unit increase in coefficient of variation increased the odds for companies being prosecuted for fraud (versus not prosecuted for fraud) by 0.02 or 2.0% (Black, 1999). This significant finding means that the companies prosecuted for fraud had lower coefficient of variation as compared to the companies not prosecuted for fraud because the Exp(B) coefficient was a positive value indicating that the probability a company was prosecuted for corporate fraud increased when the coefficient of variation increased. The same observation was determined in the mean comparison.

Table 10

Variables in the Equation for Controlled Logistic Regression with Predictor Variables

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Percentile change in income	.00	.00	.02	1	.89	1.00
	Sales Growth Rate	-.01	.01	.65	1	.42	1.0
	Coefficient of variation	.02	.01	4.65	1	.03	1.02
	P/E ratio	-.03	.03	.99	1	.32	.98
	Constant	-.41	.27	2.32	1	.13	.67

[a]Variable(s) entered on step 1: Coefficient of variation, P/E ratio.

Lastly, multicollinearity in the logistic regression solution is detected by examining the standard errors for the b coefficients (S.E.). A standard error larger than 2.0 indicates multicollinearity among the predictor variables. All S.E. coefficients in table 10 were less than 2.0. Thus, multicollinearity did not exist between the predictor variables.

Evaluation of Findings

This quantitative, ex post facto research study provided an evaluation of two variables measuring corporate share price and their relationship to company fraud status (prosecuted for fraud versus not prosecuted for fraud). The theoretical foundation for this research study was the efficient market hypothesis, which explains share price behavior in public markets. The strong-form version of the efficient market hypothesis states that share prices reflect all available public and private information and as a result, makes it impossible to profit from private data. Under the strong-form version, share prices of companies prosecuted for fraud would be lower than companies not prosecuted for fraud, thus reflecting the fraud in the share price. Because a perfectly efficient market does not exist, the semi-strong form of the efficient market hypothesis is often used to explain share prices that initially do not reflect the market price. As such, under the semi-strong

version, share prices for companies prosecuted for fraud would reflect temporary differences in share prices for companies prosecuted for fraud that would be similar to companies not prosecuted for fraud.

Research question 1 examined the relationship between the coefficient of variation of share price (calculated as the standard deviation of the company's share price divided by the average share price), computed over one year and the probability of a company being prosecuted for fraud. The statistical result of logistic regression showed that the coefficient of variation of share price, computed over one year, predicted the probability that a company would be prosecuted for fraud. This finding suggested that the coefficient of variation of share price reflects share price differences in companies prosecuted for fraud and companies not prosecuted for fraud, thus supporting the strong-form version of the efficient market hypothesis. As a result, the coefficient of variation could potentially be used as an indicator of fraud. This finding is consistent with results from other researchers (Boettke, 2010; Gavious, 2009; Hegazy & Kassem, 2010; Himmelmann et al., 2012; Murcia & Borba, 2007). For example, both Murcia and Borba (2007), and Hegazy and Kassem (2010) used questionnaires to identify corporate measures helpful in identifying fraud. They found that specific quantitative measures similar to the coefficient of variation of share price could be used to identify potentially fraudulent situations. As a result, the finding for the coefficient of variation adds to the previous studies that identified quantitative fraud indicators. Furthermore, Rao (2009) found that mutual funds do not outperform investing in a random portfolio, and these results uphold the strong-form version of the efficient market hypothesis as the theory states that share prices cannot earn a return higher than the market because all

information is already incorporated into the share price. Likewise, Hemmelmann et al. (2012) found in their study using cumulative abnormal returns that the efficient market hypothesis is also supported when outside factors and noise are compensated for in research using share prices. Here, their study focused only on share prices by eliminating economic and industry factors that also affect share prices. As a result, the study was able to uphold the efficient market hypothesis by determining that share prices reflect all available information, and thus, cannot be predicted. Additionally, Boettke (2010) performed research that supported Dunbar and Heller's research in that a model to predict share prices could not be created. Like the findings with the coefficient of variation, prediction of share prices is not possible because all available information is already incorporated into the share price, thus upholding the efficient market hypothesis.

On the other hand, this finding is inconsistent with other studies that have tested the efficient market hypothesis. For example, Yen and Lee (2008) found that a perfectly efficient market does not exist, and as a result, share prices do not always reflect the market value. Inconsistencies between this study and the research by Yen and Lee exist because Yen and Lee focused only on the Indian stock market, which carries a different level of efficiency than the American stock markets. Additionally, noise factors were not accounted for in Yen and Lee's study, and thus may result in inconsistent results based on economic and industry factors within the market.

Research question 2 examined the relationship between the price/earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud. The price/earnings ratio was not effective at predicting whether or not a company was subsequently prosecuted for fraud. Thus, the price/earnings ratio did not appear to be an

indicator of fraudulent activity and thus, supports the semi-strong version of the efficient market hypothesis. The semi-strong version of the efficient market hypothesis is less stringent than the strong-form in that the assumption of the semi-strong form is that a share market is not perfectly efficient, and as such, some private information may not be reflected in the share price (Westfall, 2010). As a result, the finding that the price/earnings ratio is not a significant indicator of fraud could result from share prices that have not yet incorporated private, fraudulent information. This result supports the study conducted by Louhichi (2008) that found positive abnormal share returns are restored to the normal share price within 15 minutes and that negative abnormal share returns are restored to the normal share price within 30 minutes. This finding is also consistent with findings from other studies (Dunbar & Heller, 2006; Glen & Hornung, 2005, Yen & Lee, 2008). For example, in the study by Yen and Lee (2008) discussed above, a perfectly efficient market does not exist, and as a result, share prices often do not reflect all relevant information in a timely manner. The insignificant finding of the price/earnings ratio in this study supports Yen and Lee's study in that the occurrence of fraud was not reflected in the share price. Furthermore, contrary to research supporting the efficient market hypothesis, researchers have identified results that contradict the efficient market hypothesis (Ilg, 2010; Muhammad & Rahman, 2010). In fact, Ilg (2010) found that inside traders can and do profit from private corporate information. This contradicts the efficient market hypothesis, as the ability to profit from information in this theory is impossible because share prices always reflect the market value. In addition, Muhammad and Rahmann (2010) identified share price patterns by the day of the week, which indicate that share prices can be predicted. According to the efficient market

hypothesis, share prices can never be predicted because all relevant information is incorporated into the price. Thus, the results of research question 2 further supported the research above that indicated the efficient market hypothesis is not an accurate theory in the strong-form because proof exists that investors can profit from private information and that in some cases, share prices can be predicted.

The evaluation of the means and Exp(B) coefficient of the coefficient of variation of share price in the logistic regression showed that the companies prosecuted for fraud had higher coefficient of variation as compared to the companies not prosecuted for fraud. Lower coefficient of variation indicates that the share price had a lower dispersion around the mean price, while higher coefficient of variation means that the share price had a greater dispersion around the mean, indicating a more volatile share price (Ratner, 2009). This suggested that the companies prosecuted for fraud had share prices that had greater dispersion around the mean price, while companies not prosecuted for fraud had a less volatile share price. The strong-form efficient market hypothesis was confirmed by the results since the fraud was reflected in the share price in terms of the coefficient of variation measure.

In addition, while the studies were unable to prove, they do contradict previous studies on the influences of percentile change in income, sales growth rate, and P/E ratio to the probability of a company being prosecuted for fraud. Although the means between the companies that were prosecuted and not prosecuted for fraud were different, these were not significant based on the logistic regression results. The results from this study contradict the growth rate identified by Kedia and Philippon's (2009), who found higher growth rates for firms involved in earnings management practices related to fraud. The

differences found between these two studies could be the result of the study focus. Kedia and Philippon studied growth rates specifically in earnings management practices. In this type of practice, management purposefully manipulates earnings to meet analysts' expectations. The results from this fraud study indicated that the growth rate was not a significant predictor of fraud; however, the fraudulent companies used did not all commit fraud through earnings management practices. Thus, the growth rate can be an accurate predictor of a specific type of fraud, but not necessarily all types of fraud. Also, on the study of Ball (2009), who found most fraud occurred during periods of economic expansion and Gray et al.'s (2007) study that found during economic bubbles, the intrinsic share value is lower than the share price. These studies, that identified a difference in the intrinsic and market share prices, identified factors outside of the corporate factors (including economic and industrial factors) that increase the opportunity to commit fraud. As a result, outside factors can prevent share prices from reflecting all available information, thus refuting the efficient market hypothesis. Incorporating non-corporate factors into this study should be performed as an additional study to identify the effect of those factors and whether or not those factors are also related to fraud identification. Lastly, the mean observation suggested that the shares of companies prosecuted for fraud tended to be more expensive relative to the companies that were not prosecuted for fraud. This was also insignificant.

Summary

The purpose of this study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices), by investigating the

extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The results of the logistic regression test resulted in the rejection of null hypothesis one only. The test result suggested that there was a statistically significant relationship only between the coefficient of variation of share price, computed over one year, and the probability of a company being prosecuted for fraud using a controlled logistic regression. On the other hand, the results of the logistic regression did not lead to the rejection of null hypothesis two. The test result suggested that there is no statistically significant relationship between the P/E ratio, computed over one year, and the probability of a company being prosecuted for fraud using a controlled logistic regression. Also, the logistic regression results showed that the control variables of percentile change in income and sales growth did not influence the relationship between the predictor and criterion variables. In the next chapter, an overview of the study, the reasons and rational for its undertaking, highlight of the findings and conclusions, discussion of the implications of the results, as well as recommendations for action and future study are presented.

Chapter 5: Implications, Recommendations, and Conclusions

The purpose of this quantitative study was to examine the strong-form version of the efficient market hypothesis by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The study was conducted using data from 139 companies listed with the SEC and traded on an American stock exchange, 70 of which were prosecuted for fraud, between 2000 and 2004, and 69 of which were not prosecuted for fraud (Manahagar Tel Nigam was rejected from the analysis for missing data). Because of the rejection of Manahager Tel Nigam, of the 16 companies in the analysis within the same SIC code, Compuware was duplicated in the analysis as the alternate "match" since it most closely matched the time frame of the company pair. A logistic regression was done to classify the companies in terms of fraud status, based on the two predictor variables. Specifically, two predictor variables were used to determine whether or not the variables could differentiate between companies prosecuted and not prosecuted for fraud: (a) the coefficient of variation of share price (defined in Chapter 3), and (b) the P/E ratio (continuous). Meanwhile, the criterion variable for this study was the prosecution for fraud, which is a dichotomous variable.

Several limitations were identified for the current study and are discussed below in order of the specificity of the relevance of the results. First, even though the use of financial indicators derived from the COMPUSTAT database were used, using only quantitative indicators can still be considered a limitation because of the lack of a holistic view with regard to the evaluation of fraud status of an organization. More so, the external factors that affected the recorded data should have been analyzed as well in order

to give more reality and integrity on the results (Black, 1999). Therefore, some caution should be used when other researchers cite the results of this study.

A second limitation is the limited number of financial fraud indicators that were considered. For the study, only the coefficient of variation of share price and P/E ratio were considered. The limited number of indicators was selected to identify whether or not a simple indicator existed that could be easily used by any stakeholder. However, other financial fraud indicators should be considered like liquidity ratios and market share indicators among others. Given that, proper and accurate computational techniques should also be given importance since it will greatly affect the data set to be analyzed.

The third limitation to this study was the data collection procedures. Data were gathered basically from an archival database and were retrieved for analysis. Further refinement and analysis should have been done to sort the data into a usable data set. That is, making sure that externalities were considered and making sure that data were lifted from the same economic conditions to exclude the effect of market conditions.

A final limitation was the potential for researcher bias. To set aside personal and computation biases, it is important to acknowledge that different companies weigh different fraud indicators differently and they sometimes compute for these indicators differently depending on the perspective the organization is taking. Strauss and Corbin's (2008) guidelines were followed, including comparing the data carefully and periodically reviewing the literature for similar examples.

The study addressed the problems involved in detecting fraud early with available data. The efficient market hypothesis, which states that share prices reflect all available information, was used as the theoretical foundation for the study. For the most part, the

findings were consistent with literature reviewed that identified share price related measures as indicators of fraud. Prior to the commencement of this research study, an application was approved through the IRB. The ethical issues associated with this research study were minimal. The primary ethical issue under consideration was the accurate collection of data. To minimize this issue, the data was obtained from a third party database that contains corporate data adjusted for any stock splits and dividends. This chapter will discuss the study implications and recommendations. The chapter will conclude with suggestions for future studies.

Implications

The following research questions guided the study: (a) What is the relationship (if any) between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud? and (b) What is the relationship between the P/E ratio computed over 1 year and the probability that a company was prosecuted for fraud?

A Pearson's correlation coefficient was calculated to determine the correlation between the predictor variables of coefficient of variation of share price and P/E ratio. Results from this study revealed that the coefficient of variation and P/E ratio were not significantly correlated. The lack of relationship means that the possibility of unfavorable collinearity (low or non-existent degree of correlation between the indepredictor variables) exists and thus logistic regression was used.

Three logistical regression models were developed to determine the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for

corporate fraud. Using a hierarchical method, the first model generated was a null model, which was a model with no predictors. The result showed that the constant was insignificant. Likewise, the probability value of the overall statistics of the regression model not including the two control variables was insignificant, implying that the control variables do not have any significance to the criterion variable once they are included in the model. Moreover, the second model did have control variables that were included in the regression model. The probability value of the chi-square test from the logistic regression analysis was greater than the level of significance, thus indicating the insignificance of the model. The results suggested that none of the two control variables had any significant influence or association to the criterion variable. Lastly, the third model had both the control variables and predictor variables included in the regression model. The result showed that the chi-square test had a value less than the level of significance, thus indicating the significance of the relationship between the predictor variables and the criterion variable. Therefore, the null hypothesis that there is no difference between the model with only a constant and the control variables versus the model with the predictor variables was rejected. Each question and related hypothesis will be discussed separately along with logical conclusions. In addition, the limitations will be discussed and interpreted based on the affect they may have on the results. The relationship of the questions to the study purpose, the significance of each question and the association with the existing literature will be discussed.

Question 1: Relationship between fraud and the coefficient of variation. The research question and hypothesis that was tested to ascertain the extent to which the

coefficient of variation of share price prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud are as follows:

Q1: What is the relationship (if any) between the coefficient of variation of share price (calculated as the standard deviation of share price divided by the company's average share price) computed over 1 year and the probability of a company being prosecuted for fraud?

$H1_0$: There is no statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

$H1_a$: There is a statistically significant relationship between the coefficient of variation of share price computed over 1 year and the probability of a company being prosecuted for fraud.

The coefficient of variation is an example of a fraud indicator, which was defined as the standard deviation of a company's share price divided by the average share price. This study investigated the relationship between the coefficient of variation of share price with the possibility of an organization being prosecuted of fraud. The controlled logistic regression analysis revealed that there is a statistically significant relationship between the coefficient of variation, computed over 1 year and the probability of a company being prosecuted for fraud. This means that coefficient of variation is a significant predictor for an organization's fraud status. Because the coefficient of variation was determined to accurately predict fraud status, several implications exist including the ability (1) to use the coefficient of variation of share price to minimize fraud costs, (2) to use the fraud

indicator in an effective and accurate manner, and (3) of management to use the indicator to create corporate strategies. Each of these implications is discussed below.

The first implication of this study's results is the ability of stakeholders to use a simple corporate measure consisting of available public information that can aid in identifying companies currently in a potentially fraudulent environment. Albrecht et al. (2012) defined fraud as an act of deceit for the purpose of personal gain. Fraud literature identifies various personnel within an organization that can engage or participate in fraud and the different types of fraud including financial-statement fraud, occupational fraud, and other non-financial types of fraud. Regardless of what type of fraud is existent in an organization, fraud is a serious matter which spreads negative consequences such as negatively affecting the share price of a company, creating losses for stockholders, employees, vendors, and customers, and results in an inability to increase corporate capital among others (Lord, 2010; Murphy & Tibbs, 2010; Rezaee & Riley, 2010). There are instances where financial fraud remains undetected for a long time, which causes dispute in the organization once it is detected. According to Hogan et al. (2008), fraud is primarily detected through the use of quantitative or qualitative indicators such as the coefficient of variation of share price. These fraud indicators are used by stakeholders to make informed investment and business decisions (Kolman, 2007). Further, Hegazy and Kassem (2010) stated that indicators were based on elements of fraudulent financial statements that increased the likelihood of detecting fraud. Such indicators can be used to monitor and identify potentially fraudulent situations early on to minimize personal financial damage. Public fraud detection can serve as a fraud deterrent and as an early detection mechanism. Through the identification of additional, simple fraud indicators,

stakeholders will have the ability to use the indicators to make informed decisions. The coefficient of variation uses share price, a readily available metric, to identify potentially fraudulent situations. Thus, this study adds to the body of evidence that exists to help stakeholders make informed decisions using the efficient market hypothesis and simple metrics to identify potentially fraudulent situations.

Another implication of a fraud indicator such as the coefficient of variation is the potential to limit or minimize the cost of fraud. The global cost of fraud is at least $2.9 trillion annually and this amount is increasing yearly, which approximately represents 5% of annual corporate revenues (Association of Certified Fraud Examiners, 2010). Lenard et al. (2009) purported that such high level of fraud is believed to be a result of ineffective legislation and a lack of easily identifiable fraud indicators. Hence, the identification of accurate models and indicators are important in order to minimize the high costs associated with fraud. This research study identified an additional metric, coefficient of variation of share price, which can be incorporated into the current models to improve the accuracy rate of the fraud detection models.

Implications of using fraud indicators exist because knowing what predictor is significant does not necessarily mean that an organization is already equipped in knowing whether there is existing fraudulent activity in their organization. Reliable and up-to-date data should allow researchers to develop financial fraud indicators in order to give stakeholders the ability to make accurate decisions. Hegazy and Kassem (2010) asserted that stakeholders use fraud indicators to make informed decisions. Several fraud indicators must exist to increase the likelihood of detecting and preventing fraudulent financial statements. Identifying new indicators such as the coefficient of variation of

share price in this study adds to the research that is conducted to develop models using indicators to prevent and detect fraud. Both internal and external stakeholders use these indicators to monitor and identify potentially fraudulent situations early, as a way of minimizing damage to the company and the stakeholders. In addition to education on fraud, consumers need indicators to trigger further analysis of corporate information to make sound decisions. Identifying a timely external indicator of fraud based on public information related to share price and P/E ratios could help stockholders make informed decisions and identify problems before fraud results in financial damage to a company.

The results of the study may have implications to stakeholders or the management of an organization regarding the development of strategies to safeguard their financials and develop ways to prevent fraudulent activities within the organization. There is a need to focus on developing management talent skills in the implementation of policies regarding the development of such strategies. Key people should be in place to oversee and manage different activities that are prone to fraudulent activities. Much of the focus is sometimes directed at the employees and how they can contribute to a company's growth, but the influence of leaders in affecting the organization's culture should also be taken into consideration. Kranacher et al. (2011) asserted that methodologies should exist in identifying warning factors that point to a need to review a company further to determine if fraud is present. This study adds to the existing research to identify methodologies using metrics to create warning factors that point to a need for stakeholders to evaluate a company for fraud. As mentioned, external stakeholders can use indicators to make better decisions and to provide information to create an awareness of potential problems (Agnew et al., 2009).

Question 2: Relationship of fraud to the P/E ratio. The research question and hypothesis that was tested to ascertain the extent to which the price/earnings (P/E) ratio predicted whether a company was subsequently prosecuted for corporate fraud are below:

Q2: What is the relationship (if any) between the P/E ratio computed over 1 year, and the probability that a company was prosecuted for fraud?

$H2_0$: There is no statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

$H2_0$: There is a statistically significant relationship between the price to earnings ratio computed over 1 year and the probability of a company being prosecuted for fraud.

The price/earnings (P/E) ratio is a ratio used to determine the value of a company. This ratio is a division of the market value per share by the corporate earnings per share. A high ratio suggests that investors anticipate future earnings growth (Ikoku & Hosseini, 2010). For the purpose of the study, the P/E ratio was already in a standard ratio form and therefore did not need to be computed in terms of the S&P 500 value. The P/E ratio can range from zero to infinity. The higher the P/E ratio, the more expensive the company shares are relative to other companies. Likewise, a lower P/E ratio indicates the company was priced lower based on the return. The controlled logistic regression results revealed that there is no statistically significant relationship between the P/E ratio, computed over one year and the probability of a company being prosecuted for fraud using a controlled logistic regression (Farraway, 2002). The null hypothesis was not rejected, indicating that the P/E ratio was not a significant indicator of fraud.

One limitation of using the P/E ratio is that corporate share prices fluctuate continually. As a result, selecting a share price to use in the ratio can be problematic. In this research study, the share prices were selected over a one-year period to obtain an average price. Wide fluctuations of share prices in opposite directions over the course of the year can cancel out the appearance of the fluctuations. Regardless, selection of a share price measure can prove to be difficult and inconsistent based on the current share market conditions and the economic environment.

Another limitation existed in using the P/E ratio because when financial statement fraud is committed, both the share price and the earnings per share reflect the fraud. As a result, the relationship of the two variables comprising the ratio potentially remains constant whether fraud is committed or is not committed. Thus, because the ratio could reflect fraud in the numerator and in the denominator, this ratio was not an effective predictor of fraud. However, further research could identify uses for the ratio as it relates to other companies within a specific industry where the ratio is expected to be more uniform.

Because the P/E ratio was not significantly different between companies prosecuted for fraud and companies not prosecuted for fraud, the results did not support the strong-version of the efficient market hypothesis; the share price of companies prosecuted for fraud should have included the information regarding the fraud in the share price, thus lowering the share price of companies prosecuted for fraud in comparison to the companies not prosecuted for fraud. This result supported findings by Illg (2010) and Glen and Hornung (2005), who posited that the efficient market hypothesis makes assumptions not applicable to all situations and thus, insiders can profit

from private corporate information. Other researchers also found that share prices often experience predictable patterns within specific months and days and thus, also disproved the efficient market hypothesis (Boettke, 2010; Muhammad & Rahman, 2010). Similar to the finding in this research regarding the price/earnings ratio, the researchers above found that share prices between companies prosecuted for fraud and not prosecuted for fraud were not significantly different because evidence of the fraud was not reflected in the share price.

Financial fraud indicators considered in the study turn out to be either significant (coefficient of variation of share price) or insignificant (P/E ratio), and as such it can be inferred that some indicators might not be suitable predictors for an organization's fraud status. More so, such findings give that opportunity to explore other possibilities and factors that can affect an organization's fraud status. One factor that can be looked at is the often changing business and economic conditions where an organization resides. Stewart (2006) identified factors associated with economic growth as a potential opportunity for fraud. These factors included market complexity, increased computer automation, business globalization, and changing government regulations. These so-called economic factors provide both incentives and opportunities from changing economic conditions. The relationship of share price to specific economic conditions and industry specific conditions can further extend this research study to evaluate additional variables affecting share price. Other researchers claimed that still financial indicators are the best predictors for fraud. Smith, et al., (2005) found that operating and financial stability is most important in judging indicators of fraud through financial indicators.

Again, this study can be extended through the identification of variables of financial stability related to share prices.

The lack of significance of the P/E ratio suggests that understanding the benefits of fraud-proof strategies does not necessarily translate into practice. The results of the study indicated that managers may choose indicators that are not significant predictors of a company's fraud status and thus must be cautioned about. A strategic plan may be needed for managers to effectively select financial fraud indicators to safeguard their own companies. Based on the results of this research, several recommendations exist for further research and refinement of the existing study.

Recommendations

To extend the literature with regard to the strong-form version of the efficient market hypothesis, several research recommendations are proposed. First, a qualitative research could validate the results of this study. As discussed, qualitative indicators are also used by stakeholders in order to know the fraud status and financial capability of an organization. For example, Anderson and Tirrell (2004) found that financial reporting fraud often originates from a lack of management integrity. Whereas this study focused on quantitative fraud measures, additional research can be performed to connect the qualitative measures found in Anderson and Tirrell's study to quantitative measures to identify a more robust model for identifying fraud. Gottschalk and Solli-Sæther (2011) also found through research on management integrity in Norway that fraud could be prevented through identification of strong, ethical leaders. Again, the qualitative findings in Gottschalk and Solli-Sæther's study could benefit from the identification of additional measures to create a new model that can prevent fraud and not just identify the existence

of fraud. Fraud prevention is the preferred focus because of reduced costs and more reliable financial information. Leadership motivation has also been explored by many researchers (Kaiser & Hogan, 2010; Johnson et al., 2009). This research area included evaluating incentives used by corporations for management performance. For example, Johnson et al. (2009) found that fraud was prevalent in companies offering management incentives in the form of unrestricted stockholdings. Similar qualitative research can expand on the studies above and evaluate corporate employees, customer satisfaction levels, and employee satisfaction. As such, taking into consideration the qualitative aspect of financial indicators would broaden the view of the efficient market hypothesis. Combining the qualitative findings of the studies above with the quantitative findings of this study can help researches create a model to both prevent and detect fraud.

Second, a quantitative study regarding the relationship between internal and external factors that help stakeholders know the financial capability of an organization can be examined. This study already identified some of the factors that potentially influence the possibility of an organization being prosecuted for fraud, but a quantitative study employing factor analysis can provide stronger evidence about the influence of the different factors that emerged from the analysis. Research evaluating internal and external factors can expand existing studies (Roxas, 2011; Miller, 2006). For example, analytical procedures using multiple indicators were performed by Roxas (2011) to identify methods to detect fraud. This research incorporated financial statement measures to determine fraudulent earnings management practices. Expanding Roxas' study to include economic factors in addition to the corporate factors used in the study could be used to determine whether or not a more accurate model to detect fraud could be

developed. The results of this study provide an additional factor that can be evaluated in Roxas' model in an attempt to further improve the model. Likewise, Miller (2006) explored early fraud identification through the review of press releases containing information suggesting fraud. Combining the above studies with this study to further develop a model that can identify fraud early to minimize costs to the stakeholders can create a more accurate model that can identify fraud earlier. Although this type of model would be too complicated to be of use to common stakeholders, this model could be used by government and oversight organizations on behalf of the stakeholders. Similar studies can identify additional measures or a combination of measures that can predict potentially fraudulent companies.

Third, a quantitative study can also determine which internal and external factors that emerged from the results of the study are more influential in predicting the fraud status of a company. The results of this study indicated that the coefficient of variation of share price appears to be a stronger factor for predicting a company's fraud status; however, a quantitative study that involves a larger sample and statistical analysis can provide stronger evidence. Researchers have identified models using numerous financial measures to predict fraud within a company (Hegazy & Kassem, 2010; Murcia & Borba, 2007). One research study by Hegazy & Kassem (2010) used fraud indicators listed in SAS 99 to develop a model to predict fraud. In a similar study, Murcia and Borba (2007) used questionnaires to identify financial measures used by auditors to identify fraud. Expanding on the results of these studies through the incorporation of additional measures such as the coefficient of variation can result in models that are more accurate and can detect fraud earlier to reduce costs. Increasing the predictors in addition to using

multiple statistical methods (i.e. logistic regression and cumulative average returns) can be evaluated in an effort to identify a more robust fraud predictor model. In addition, models can be developed that are simple to use so that all stakeholders can use available corporate information to perform a fraud analysis on a company. This information is significant in extending the literature on internal and external factors that predicts a company's fraud status.

Finally, to broaden and deepen the understanding how and why fraudulent activities happen in an organization, a phenomenological study focusing on the experiences of managers, accountants, etc. in situations where the possibility of fraudulent activities can occur or have occurred in their companies (specifically the activities associated with fraud), can be conducted. This future research is significant because the results can provide insights about the different activities that may hinder the success of an organization because of fraud. In combining the results from this study with research to identify factors hindering corporate success, a relationship with share price and share price ratios to those factors can also be addressed as a potential link to fraud research. Research on the understanding of how and why fraud occurs has been abundant (Bota-Avram, 2008; Hogan et al., 2008; Kolman, 2007). However, despite the abundance of research, few studies have connected why fraud occurs to factors that can prevent fraud based on those reasons. For example, Hogan et al. (2008) found that meeting analyst forecasts was a pressure for management to commit fraud but did not identify how to eliminate or minimize that pressure or to detect when that pressure exists. Analyst forecasts are often tied to share prices, and as a result, research incorporating the findings of this study with Hogan's study can identify fraud measures specific to

management pressure. Furthermore, Kolman's (2007) research study was performed using questionnaires based on the fraud triangle in an effort to detect and prevent fraud, but did not include a new element added to the fraud triangle, turning the triangle into a diamond. Incorporating new research findings such as the coefficient of variation of share price finding in this study can bridge past studies to current research that incorporates the latest findings with research needs that have persisted over time. As a result, further research is needed to link factors contributing to fraud to the prevention and detection of fraud.

With regard to the importance of this research as it relates to capital markets and public corporations, there are several practical applications that merit a discussion. First, identification of fraud indicators such as the coefficient of variation can aid corporate management in the risk assessment process (Fraser & Simkins, 2010). Currently, business is unpredictable, and as a result, by nature has risk. Corporate risk is directly related to the return received from investing (Ross et al., 2011). As a result, companies must perform periodic risk assessments to identify exposure and to identify and evaluate the business risks (ISACA, 2010). According to ISACA, this also aids management in ensuring effective controls are in place and that the company is in compliance with the appropriate trade organizations and laws. Meaningful risk assessments require an evaluation of many business indicators including fraud indicators (Hampton, 2009). As a result, part of the establishment of an effective enterprise risk management program is the identification of quantitative measures such as the coefficient of variation that can identify or prevent fraud risk (Moeller, 2011).

In addition to using fraud indicators as part of a corporate risk assessment, fraud indicators can also be used by management to identify areas of opportunity within a company. By evaluating suspicious areas, management can improve corporate controls to prevent fraud and also improve corporate performance. Strong internal controls are required by the Committee of Sponsoring Organizations (COSO) and companies are penalized when controls are weak or are lacking (Moeller, 2011). Strengthening controls contributes to financial savings through the prevention of fraud and through process improvement (Kranacher et al., 2011). In addition, strong control procedures and the evaluation of indicators used in the controls can improve corporate performance in areas such as production, sales and information technology (Ionescu, 2009). Reliable, quantitative techniques and measures can be developed internally in a company through the collection of data and through the analysis of internal and external events (ISACA, 2010). This data increases the effectiveness of risk assessments and allows companies to benchmark in order to improve internal controls and corporate processes.

Finally, the use of fraud indicators helps public corporations identify fraud committed against the company by vendors, customers, or unrelated third parties. Fraud is committed against an individual or organization with the intent to harm (Albrecht et al., 2012). As a result, it is also important for companies to use indicators to identify when fraud occurs through a third party. Specific quantitative measures can be identified and used to determine situations when fraud has occurred or could occur against the company (Comtois, 2009). The greater the number of indicators and the easier the indicators are to analyze, the more helpful the indicators are in detecting fraud (Kranacher et al., 2011).

Fraud protection not only requires companies to look internally for fraud, but externally as well.

Conclusions

The purpose of this study was to test the strong-form version of the efficient market hypothesis (which is the most stringent application of the theory and assumes that all information is always discounted into a company's stock prices) by investigating the extent to which changes in share price and price/earnings (P/E) ratios prior to a public announcement of fraud predicted whether a company was subsequently prosecuted for corporate fraud. The result of the controlled logistic regression revealed that the coefficient of variation of share price is a significant predictor for a company's fraud status and not the P/E ratio. The coefficient of variation of share price was computed over 1 year and the probability of a company being prosecuted for fraud was explored. Externalities of the organization such as market behavior and industry share were not given specific focus on the computation of coefficient of variation and P/E ratio. Although the P/E ratio was insignificant in predicting a company's fraud status, it is still concluded that financial indicators are important since most stakeholders use them for decision making. Moreover, the identification of accurate models and indicators are important in order to minimize the high costs associated with fraud.

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Appendix

Companies Prosecuted for Fraud

Companies Prosecuted for Fraud

Company name	Legal Action	Date of fraud announcement
McKesson HBOC	Fraudulently reported financial earnings and press releases.	April 28,1999
Sirena Apparel Group, Inc.	Enforcement action for fraud and related financial accounting and reporting abuses.	September 27, 2000
Goldman Sachs & Co.	Civil action against John Freeman for insider trading	March 14, 2000
Sunbeam Corporation	Injunctive actions for a massive financial fraud. Inappropriate accounting reserves created.	May 15,2001
MicroStrategy, Inc.	SEC filed injective actions against top three officers for materially overstating its revenues.	December 14, 2000
International Business Machines (IBM)	Books and records violations resulting from payments of $22 million to foreign officials.	December 21, 2000
Baker Hughes Incorporated	Illegal payments to foreign officials.	September 21, 2001
Nalco Chemical company	Jorge Eduardo Ballesteros Franco, et al. participated in insider trading prior to announcement that Nalco would be acquired.	May 8, 2001

Company name	Legal Action	Date of fraud announcement
CompUSA, Inc.	Alejandro DuclaudConzalez de Castilla, et al., committed insider trading with CompUSA stock prior to the announcement that CompUSA would be acquired.	May 11, 2001
Dynegy, Inc.	Improper accounting for and misleading disclosures relating to a $300 million financing transaction.	September 24, 2002
Tyco International, Inc.	SEC action against three former executives of Tyco for failure to disclose low-interest and interest free loans from the company.	January 29,2002 (Formal charges September 12, 2002)
Enron	Accounting fraud involving off-balance sheet financing.	October 2, 2002
Adelphia Communications Corporation	Exclusion of liabilities; off-balance sheet financing	July 24, 2002
MCI, Inc.	Accounting fraud of over $3.8 billion for overstating income.	June 26, 2002
Rite Aid Corporation	Accounting fraud scheme resulting in the significant inflation of net income	June 21, 2002
Microsoft Corporation	Unsupported and undisclosed reserves; non-compliance with GAAP	June 3, 2002
Xerox Corporation	Undisclosed accounting actions to meet or exceed Wall Street expectations.	April 11, 2002

Company name	Legal Action	Date of fraud announcement
Quintus Corp.	Action against Alan K. Anderson for forged contracts, e-mails, purchase orders, letters, and audit confirmation to boost financial results.	May 20, 2002
Ashford.com, Inc.	Civil action against former CEO for finance for deferring $1.5 million in expenses under a contract with /amazon.com.	June 10, 2002
Kimberly-Clark Corporation	Inaccurate annual financial statements filed from 1995-1998. Inaccuracies arose from restructuring charges after merger with Scot Paper Company.	March 27, 2002
Waste Management, Inc.	Massive financial fraud lasting more than five years in which the company overstated pre-tax earnings.	March 26, 2002
AremisSoft Corporation	Civil action against corporation and former officers for overstatement of the value of the company contracts, revenues, and recent acquisitions. In addition insider trading by officers.	October 5, 2001
Brightpoint, Inc.	Civil enforcement action for their roles in fraudulently manipulating earnings.	September 11, 2003
AIG (American International Group)	Fraudulent manipulating Brightpoint's earnings	September 11, 2003
J.P. Morgan Chase	Manipulation of the financial statements of Enron Co.	July 28, 2003

Company name	Legal Action	Date of fraud announcement
Citigroup	Manipulation of the financial statements of Dynegy Inc.	July 28, 2003
Gemstar TV Guide International, Inc.	Top executive officers Henry Yuen and Elsie Leung used tactics to overstate Gemstar's total revenues.	June 19, 2003
Xerox Corporation	Paul Allaire et al. engaged in fraudulent scheme that misled investors about Xerox's earnings to improve its Wall Street reputation	April 11, 2003 Complaint filed.
HealthSouth Corporation	Earnings overstatement and falsification of financial results.	March 8, 2003
Qwest Communications International, Inc.	Eight current and former officers and employees inflated company's revenues by $144 million to meet earnings projections.	February 25, 2003
ImClone Systems, Inc.	Martha Stewart indicted for selling stock based on material non-public information.	December 28, 2003
NCI Building Systems	Restated financial statements from 1999 – 2001 due to overstated net earnings.	October 9, 2003
Avis Budget Group, Inc.	Falsified earnings to inflate revenue by $500 million as a part of CUC International (Comp-U-Card).	April 16, 1998
ABB Limited	Company management was convicted of violating anti-bribery, books-and-records, and internal-accounting-controls provisions.	July 6, 2004

Company name	Legal Action	Date of fraud announcement
Arabian American Development	Violated section 13 of the Exchange Act by publishing misleading financial statements.	October 15, 2003
BJ Services Co.	Management paid customs agents to illegally import equipment from Argentina.	March 10, 2004
Bristol-Myers Squibb Co.	Overstatement of sales and earnings to exceed company and analyst financial projections.	August 4, 2004
CA Inc.	Management manipulated quarterly earnings and thus, overstated revenues.	September 22, 2004
Calamp Corp.	Failed to establish or maintain sufficient accounting controls.	April 29, 2004
Canadian Imperial Bank	Reported the acquisition of BC&D Oil and Gas that was never consummated. Issued 10 million shares in an undisclosed transaction.	December 23, 2003
Charter Communications, Inc.	Financial statements included material misstatements.	July 27, 2004
CKRush, Inc.	Financial statements included material misstatements and errors including recording assets at double the net worth.	March 24, 2004
CMS Energy Corp.	Materially overstated revenues, expenses, and energy trading volumes using round trip energy transactions.	March 17, 2004
Corrpro Companies, Inc.	Misstated financial statements for an Australian subsidiary that were not discovered due to a lack of internal controls.	January 16, 2004

Company name	Legal Action	Date of fraud announcement
Cumulus Media, Inc.	Prematurely recorded revenue to inflate the income on the financial statements.	December 10, 2003
Dean Foods Co.	Created false earnings to meet analyst expectations by accelerating revenue recognition.	September 14, 2004
DGT Holdings Corp.	(formerly Del Global Technologies) Management overstated reported revenues causing numerous material misrepresentations in Commission filings and in press releases.	June 1, 2004
DT Industries, Inc.	Failed to properly recognize costs associated with various projects in order to reach projected earnings. Hid costs in unrelated accounts.	March 4, 2004
Exterran Holdings, Inc.	Management inflated pre-tax earnings to meet analysts' expectations. Additionally, material internal control deficiencies existed.	December 18, 2003
Finish Line, Inc.	Included materially false and misleading information in their SEC filings.	February 2, 2004
Gateway, Inc.	Issued reports containing misleading disclosures to meet or exceed Wall Street analysts' expectations.	November 13, 2003
General Electric, Co.	Failed to disclose full compensation and retirement benefits for executive management.	September 23, 2004

Company name	Legal Action	Date of fraud announcement
Genesco, Inc.	Filed financial statements that materially overstated net earnings.	December 19, 2003
Gerber Scientific, Inc.	Issued materially inaccurate financial information.	April 8, 2004
Gold Banc Corp, Inc.	Misappropriated $1 million in "earnest money" and misappropriated $900,000 in refunds and tried to hide the misappropriations.	May 4, 2004
Halliburton, Co.	The company failed to inform investors that the company offset cost overruns through the application of SOP 81-1 and the offsets materially increased reported income.	August 3, 2004
I2 Technologies, Inc.	Misstated $1 billion of software license revenues.	June 9, 2004
ITA Holdings, Inc.	Management filed materially false and misleading financial statements containing improper revenue recognition.	September 16, 2004
Lucent Technologies, Inc.	Fraudulent and reckless violation of GAAP. This included circumventing internal controls, falsifying documents and hiding contracts.	May 17, 2004
McLeod USA Inc.	Failure to disclose the non-recurring nature of revenue associated with sales of certain indefeasible rights of use.	September 15, 2004
Measurement Specialties, Inc.	Accounting fraud and insider trading including overstating revenues through capitalizing expenses.	June 18, 2004

Company name	Legal Action	Date of fraud announcement
Performance Food Group Co.	Financial statement errors resulted in over-reporting net income by $4 million. In addition, action was not taken when accounts were increasingly out of balance.	February 13, 2004
Quadramed Corp.	Improperly recognized revenue from two reciprocal transactions with another firm lacking the means to pay for the products.	April 30, 2004
Schering-Plough	Conducted bribes for the purchase of Schering-Plough products.	June 9, 2004
Schick Technologies, Inc.	Company failed to account for customer returns properly and improperly recognized revenues from product shipped on a trial basis.	November 17, 2003
Senetek PLC	Management disclosed materially, non-public information in private correspondence.	September 16, 2004
Siebel Systems Inc.	Management disclosed non-public information at social events to specific individuals.	June 29, 2004
Sun-Times Media Group, Inc.	(Hollinger) Management misstated financial statements and failed to include transfers of assets to insiders.	January 21, 2004
Symbol Technologies	Management engaged in numerous fraudulent accounting practices that had a cumulative net impact of over $230 million on reported revenue	June 3, 2004

Company name	Legal Action	Date of fraud announcement
Warnaco Group, Inc.	Issued false and materially misleading press releases reporting earnings.	May 11, 2004

Note. Data adapted from the "Significant Enforcement Actions" section of the annual reports, 2000 – 2003 by the Securities and Exchange Commission.Copyright 2000 – 2003 by the SEC. Retrieved from http://www.sec.gov/about.shtml