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AUDITORS' RESPONSE TO ANALYSTS' FORECAST PROPERTIES:

SOME EVIDENCE FROM AUDIT PRICING

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Auditors' Response to Analysts' Forecast Properties: Some Evidence from Audit Pricing

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ABSTRACT

This study draws on information asymmetry theory and audit pricing theory to examine the link between analyst earnings forecasts and audit pricing in the U.S. For the empirical tests, information asymmetry is measured in two ways: (1) the lag of analysts' forecast accuracy (*LAGACCY*), and (2) the lag of analysts' forecast dispersion (*LAGDSP*). Using data from 2000 to 2012, this thesis finds that higher analyst earnings forecast accuracy (dispersion) is associated with lower (higher) audit fees. These findings are consistent with the theory that analysts, as important financial intermediaries, provide useful information to third parties, including auditors. Further, the results suggest that these associations are stronger (1) for small firms, and (2) for younger firms, consistent with theory that such firms have higher information asymetry. Finally, it is found that the association between audit fees and *LAGACCY* and *LAGDSP* are insignificant for firms that are audited by industry specialists. This finding provides support that auditor industry specialization plays a part in reducing information asymetry with these audit firm types being less reliant on information provided by financial analysts.

Keywords: Audit fees, Information asymmetry, Analysts' forecasts

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CHAPTER 1

INTRODUCTION AND MOTIVATION

Jensen and Meckling (1976) coined the term nexus of contracts to describe the corporation suggesting that corporations are in essence nothing more than a collection of contracts that exist between many different parties. A major objective of the corporation is to design these contracts in such a way so as to minimize contracting costs, including agency costs. These contracts are made between individuals and separate entities. There are a myriad of types of written and unwritten agreements made between individuals and the firm. These contracts include both formal and informal contracts, and accounting is an integral part of these contracts that make up the firm. The contracts themselves, along with their enforcement and monitoring are costly and, as such, can affect the firm's profitability and survival. However, it is not possible to write contracts that cover every contingency within the business environment. This leads to notion of incomplete contracts. The difficulties associated with writing contracts to cover every possible situation or contingency, and the monitoring of these contracts becomes significant due to agency problems. According to Jenson and Meckling (1976), an agency relationship is a contract under which the principal engages an agent to perform some service on his behalf and in doing so delegates some decision-making authority to the agent. An agent is likely to have

differing interests to those of the principal. These may include consuming perquisites, plush officers, and risk minimization, among others. In contrast, the principal is assumed to be interested predominantly in the financial returns on investment. Differences between the interests of these two parties may result in the agent having an incentive to bias information that flows to the principal. Jenson and Meckling (1976) suggest that the principal can use two mechanisms in order to limit such divergence of interests: (1) incentive contracts, and (2) monitoring mechanisms.

The financial statement audit is a monitoring mechanism that helps reduce information asymmetry and, as such, helps to protect the interests of the principals, primarily existing stockholders and potential future stockholders. Independent audits provide reasonable assurance that managements' financial statements are free from material misstatements (Watts and Zimmerman, 1986). The monitoring hypothesis posits that for financial statements to be effective in reducing agency costs, the principals must be provided with some assurance that the financial statements have been prepared in accordance with the provisions of the contract between the principal and the agent. This gives rise to the demand for audits. An audit certification given by competent and independent auditors provides assurance that the financial statements have been prepared in accordance with a set of recognized and accepted accounting

standards, and that they present a true and fair view of the economic transactions that have occurred during the accounting period being audited.

The information hypothesis posits that financial statement users (including investors and creditors) demand for an independent audit of financial statements as such provides information that is useful to investors in making their investment decisions. A comparison of the monitoring hypothesis and the information hypothesis indicates that similar motivations towards demanding an audit derive from both hypotheses. Some of the same information that is used in the monitoring of contracts is also useful in making investment decisions. However, the two theories differ as to which provides for the demand for audited financial statements. The monitoring hypothesis suggests that the manager contracts with the principal to provide audited financial statements in order to minimize the subsequent reduction in compensation that would occur in the absence of such monitoring being undertaken. In contrast, the information hypothesis posits that financial statement users demand audited financial statements to assist in their making of investment decisions.

A third hypothesis exists as to how the demand for audits evolved which is based on the auditors' liability that occurs when audited financial statements are subsequently determined to have been made in error. The ability of users of audited financial statements to collect damages from the "deep pockets" of audit firms provides the basis for the insurance hypothesis. The auditors have "deep pockets" relative to a bankrupt or failing company that cannot repay its debts. The extent of the auditor's legal liability is substantial, and this has been particularly problematic for auditors in relation to going concern issues. Palmrose (1987) documents that almost 50 percent of litigation against auditors involved clients experiencing financial failure or severe financial difficulties. Lennox (1999) concludes that larger auditors with "deeper pockets" are more likely to face litigation despite the higher audit quality provided by these firms (Francis 2004). This occurs indicates the existence of an insurance effect, with the resultant liability faced by auditors likely playing a part in explaining both the demand for audits, and the quality of audits performed.

1.1 Audit quality

Recent corporate failures, such as Enron and WorldCom, have brought the auditing profession under intense regulatory scrutiny. This has led U.S. policy makers

to confront issues relating to the improvement of audit quality. As a response to these large audit failures, the Sarbanes-Oxley Act 2002 was enacted by the U.S. Congress on 30th July 2002. This legislation put in place a new regulatory body, the Public Company Accounting Oversight Board (PCAOB), to oversee the audits of public companies. The objective of PCAOB is to protect the interests of investors, and to enhance the public confidence by addressing the need for more informative, accurate, and independent audit reports.

Audit quality is not defined in the auditing standards. Auditing standards provide guidelines to auditors concerning compliance with the accounting standards. This assists auditors in the performance of their duties and compliance with the standards is the best defence for an auditor that work undertaken is consistent with being at an acceptable level of quality. DeAngelo (1981b) defines audit quality as the market-assessed joint probability that a given auditor will have both (1) the capacity to detect material misstatements in the client's financial statements, and (2) the independence to report material misstatements when they are discovered. Using the size of audit firms as a proxy for audit quality, DeAngelo (1981b) argues that higher audit quality, that is, audits performed by large audit firms, are associated with lower levels of information asymmetry. Becker, DeFond, Jiambalvo and Subramanyam

(1998) provide evidence that higher audit quality is negatively associated with positive (income-increasing) discretionary accruals. This finding suggests that lower audit quality would be associated with higher levels information asymmetry. Pittman and Fortin (2004) find that younger firms that employ the services of large auditors are associated with lower borrowing costs. These authors argue that this is because the higher audit quality associated with large auditors reduces the information asymmetry associated with young firms resulting in lower borrowing costs.

There have been many studies investigating the effect of information asymmetry and demand for audit, but no prior studies investigating the effect of information asymmetry on the work performed by auditors. That is, no studies have considered the association between information asymmetry and audit fees. The agency cost, caused by information asymmetry, along with conflicts of interests between managers and shareholders provide incentives for managers to withhold information from the auditors and conceal accounting irregularities. This is likely due to managers not wanting such accounting irregularities being revealed to the board of directors and shareholders. Managers may be motivated by a fear not receiving a bonus, of being fired, or perhaps the costs associated with breaching debt covenants. It also could be they do not want to reveal the true financial position

to other contracting parties, such as creditors and regulators. If auditors had perfect information about managers' intentions and actions, there would be no information asymmetry between auditors and managers. However, information asymmetry exists when perfect information is absent. This is evidenced by audit failures and corporate frauds that have occurred.

1.2 Motivation and research question

This thesis seeks to investigate the effect of information asymmetry on the supply-side of audit pricing by using the lag of analysts' forecast as a proxy for inherent risk. First, I examine whether there is any association between audit fee and the lag of analysts' earnings forecasts. Analysts may affect auditors' risk assessment due to their forecast output having both an informational and monitoring role. The informational and monitoring roles of an analyst may help auditors gain a better understanding of the client's business and industry. This would affect the auditor's assessment of the firm's inherent risk. As such, I expect that firms with higher inherent risks will be associated with lower analysts' forecast accuracy, and higher analysts' forecast dispersion, and expect that these firms will be associated with higher audit fee given that these firms have higher perceived assessed risk. This is in

line with Simunic (1980) and Gul (2007) who argue that the audit fee charged is a function of the size and complexity of the firm, and the assessed audit risk of the audit client to the audit firm. Second, a test was done on whether the association between audit fees and the lag of analysts' forecasts are weaker for larger firms. Consistent with the theory that small firms (in terms of asset size) are more inherently risky, it is posited that for these firms the association between forecast accuracy (and dispersion) and audit fees will be stronger. That is, it is expected that higher analysts' forecast accuracy in these firms will be associated with lower audit fees, and that greater analysts' dispersion for these firms will be associated with higher audit fees. The reason for this expectation is because there is less information available for these small firms, including lower numbers of analysts following these firms. The higher level of information asymmetry that is present in these firms leads these firms to be assessed as being inherently more risky as perceived by their auditors. It is posited that the presence of higher forecast analysts will be informational to auditors, given that there is comparatively less information publicly available concerning them, leading to lower perceived risk and audit fees. For the same reasons, higher dispersion for these small firms will lead auditors to perceive higher risk leading to a comparatively higher audit fees being charged. Third, a test was done on whether the association between audit fees and the lag of analysts'

earnings forecast is stronger for younger firms. Younger firms have higher informational problems compared to older, more established firms which should affect the auditors' assessment of inherent risk. Lastly, whether the association between audit fees and the lag of analysts' forecast is weaker for clients audited by specialists is considered. Auditor industry specialists should be in a position to make higher quality professional judgments. They should be in a position to better assess their client's inherent risk and should potentially rely comparatively less on information that is provided by financial analysts.

This thesis research questions are motivated by Behn, Choi and Kang (2008) who provide evidence that analysts' forecast accuracy is higher and that analysts' forecast dispersion is lower for firms audited by Big 5 auditors. These authors' findings show that analysts, being users of financial statements, are able to make more accurate earnings forecasts of firms that have been audited by higher quality audit firms. These authors also show that auditor industry specialization is similarly associated with higher forecast accuracy and lower dispersion. The thesis's main research question is whether it is possible that the auditors place reliance on the work undertaken by financial analysts in their assessment of audit risk. This possibility is plausible because financial analysts play an important informational

role, and it is reasonable that auditors may find such information useful in carrying out their audit. This thesis research may provide an opportunity to address prior inconsistent results concerning fee premiums attributable to auditor industry specialists. Additionally, this study may provide evidence on the effect of information asymmetry from the supply-side of auditing[1]. Furthermore, as a complement to the findings of Behn et al. (2008) who find that analysts make more accurate earnings forecasts in the presence of the financial statements being audited by higher quality (Big 5) auditors, this thesis suggests that auditors may consider analysts' forecasts and dispersion in their information-gathering when assessing the perceived risk of clients. Fourth, this is the first study that I am aware of that has considered the association between analysts' forecast accuracy, and dispersion, and their association with auditor risk assessment and audit fees.

The main experimental variable is the lag of forecast accuracy (*LAGACCY*) which is the analysts' earnings forecast accuracy in the previous fiscal year (year t-1). Analysts' earnings forecast accuracy is measured by the negative of the absolute value of forecast error scaled by stock price at time t-1. This definition is in line

[1] The supply-side of auditing perspective occurs when the auditor supplies higher audit effort in response to audit risks.

with previous studies by Lang and Lundholm (1996) and Behn et al. (2008). As an additional test, I replace the *LAGACCY* variable with lag of analysts' forecast dispersion (*LAGDSP*) which is the dispersion of analysts' earnings forecast in the previous fiscal year (year t-1). Dispersion of analysts' forecast is defined as the standard deviation of earnings forecasts issued by individual analysts. This measurement is also in line with the studies by Lang and Lundholm (1996) and Behn et al. (2008).

1.3 Major findings

This thesis results, using a sample of observations of U.S. firms from 2000 to 2012, indicate that both of the proxies for information asymmetry, *LAGACCY* and *LAGDSP*, are significantly associated with audit fees. These findings are consistent with theory that analysts, as important financial intermediaries, provide useful information to other third parties, including auditors. These findings suggest that in the presence of a higher extent of information asymmetry, auditors devote more resources to reduce detection risk so as to achieve an acceptable level of overall audit risk. In other words, auditors exert more audit effort in the presence of higher information asymmetry.

The results show that this association is stronger for small firms and younger firms. This is consistent with theory that these firms have higher informational problems. Additionally, I find that the association between audit fees and both *LAGACCY* and *LAGDSP* is insignificant for firms that are audited by industry specialist auditors. This is consistent with prior research that auditor industry specialists are more confident in their audit risk assessments (Taylor 2000), and that they are more knowledgeable and effective in the industries in which they audit (Maletta and Wright 1996; Wright and Wright 1997). The lack of significance found in relation to these audit firm types suggest that specialist auditors more efficiently assess client's inherent risk and, as such, rely to a lesser extent on information provided by financial analysts.

1.4 Thesis contribution

The results from this thesis contribute to the literature regarding the determinants of audit fees in the following ways. First, this is the first study to document evidence that the effect of analyst earnings forecast accuracy (and dispersion) is associated with lower (higher) audit fees. Second, the findings also add to the literature on the linkage between industry specialization and audit quality

(Gramling and Stone, 2001; Dun and Mayhew,2004) by providing further evidence that auditor industry specialization plays a significant role in reducing information asymmetry. Third, this thesis research also contributes to the finance literature on the informational role of analysts by demontrating that analysts reduce informational risk, and perceived risk by auditors.

1.5 Thesis outline

The reminder of this thesis is structured as follows. Chapter 2 reviews the relevant research and describes the empirical models used in testing the hypotheses. The methodology for this study, including details of sample selection, and the description of the data is presented in Chapter 3. The empirical results are provided and discussed in Chapter 4. The conclusions of this study are presented in Chapter 5.

CHAPTER 2

LITERATURE REVIEW, HYPOTHESES DEVELOPMENT AND EMPIRICAL MODEL

This Chapter reviews the extant literature on information asymmetry, and audit fees to set the stage for the current study. Since the research issues investigated in this thesis have not been previously examined, the choice of research work reviewed is inevitably judgmental. Hypotheses are developed based on prior literature and the empirical models to be employed to test the hypotheses are laid out with justification from the literature.

2.1 Information asymmetry and agency theory

In order to appreciate the importance of testing the association between audit fees and information asymmetry, it is prudent to first discuss information asymmetry. Information contributes to the functioning of the economy and a lack of credible information can weaken a market's efficiency. Akelof (1970) introduces the concept of information asymmetry by illustrating the "market for lemons" in the new and used car market. He points out the damage that can arise due to information

asymmetry by suggesting that both good and bad cars can sell for the same price if the quality of a car cannot be signalled to the purchaser. In a market where quality is unobservable, buyers do not know the quality of the product they are buying and therefore will not pay the higher price that should be required for a higher quality product. Consequently, sellers will refuse to sell high quality products because they know that they cannot receive a fair price for their products. This causes the market to reach an equilibrium where only sellers selling the worst quality products are willing to trade and only buyers interested in buying the lowest quality products are willing to buy. Therefore in the presence of information asymmetry, good cars are undervalued and bad cars are overvalued.

In a corporation, an agency relationship arises when the shareholders (principal) engage management as their agents (or steward) to act on their behalf. For this process to happen, the principals must delegate decision-making authority to the agent. Such delegation implies that the principals need to place trust in the agent and assume that the agent will act in the principals' best interest. Jenson and Meckling (1976) argue that in the principal-agent relationship, the agent who has access to information which is not be available to the principal without cost, has the opportunity to use this information to his own advantage. An agent is likely to have

different interests to the principal, such as the consumption of perquisites, plush officers and risk adversity. In contrast, the principal is assumed to be interested only in the financial return of his investment. These differences in interests may result in the agent having an incentive to bias information flow to the principal. Jenson and Meckling (1976) suggested the principal can use two mechanisms in order to limit such divergences of interest: incentive contracts and monitoring mechanisms.

From an agency theory perspective, the external (independent) audit is a monitoring mechanism that provides reasonable assurance that financial statements are free from material misstatements, and therefore helps to protect the interests of the stockholders. It aligns the interest of the principals and agents and provides a degree of assurance that the financial statements are fairly presented (Watts and Zimmerman, 1986). As such, the monitoring hypothesis posits that for financial statements to be effective in reducing agency costs, the principal must be provided with some assurance that the financial statements have been prepared in accordance with the provisions of the contract.

Financial accounting information, in line with the information hypothesis, has two major purposes. First, it provides value-relevant information for decision making. Financial accounting is a medium to transfer information from managers to the external interested parties. As such, it reduces the information asymmetry between internal and external parties. In other words, it provides a way for the manger to communicate private information to the external parties that do not otherwise have access to it. Its second purpose relates to stewardship, and financial statements are often used in contracting between the company and other external parties, such as creditors, managers, regulators and government.

2.2 Information asymmetry and earnings management

Accrual accounting provides better matching of revenue and expenses compared to cash accounting in a given accounting period as it provides flexibility for managers to select appropriate accounting methods and estimates. Therefore, accrual accounting enhances the relevance of financial statements. However, this flexibility also provides opportunities for managers to manage earnings for their own personal gain. Many studies provide evidence of managers taking actions that might not be in the interest of principals. Examples include such things as managers

cutting research and development expenditure (Dechow and Sloan, 1991), empire building whilst making negative net present value investments (Jensen, 1986), and managing earnings (Healy, 1985). Securities and Exchange Commission Chairman Arthur Levitt (on September 28, 1998 at the New York University Center for Law and Business) described five techniques of "accounting hocus-pocus" that summarized the most glaring abuses of the flexibility inherent to accrual accounting: (1) "big bath" restructuring charges; (2) creative acquisition accounting; (3) cookie jar reserves; (4) materiality; and (5) premature revenue recognition, suggesting that these threaten the credibility of financial reporting. Healy and Wahlen (1999, p.368) propose that "*earnings management occurs when managers use judgment in financial reporting and structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers*".

Agency costs, caused by information asymmetry and subsequent conflicts of interest, provide incentives for the managers to manage earnings. Some contractual incentives to manage earnings include maximizing management compensation, avoiding the breach of debt covenants, increasing job security, and the influencing

of union negotiations. Managers also manage earnings in an attempt to impact perception by the market. In a study of U.S. initial public offerings between 1980 and 1984, Teoh, Welch and Wong (1998) provide evidence that earnings are often managed in the periods surrounding IPOs. Another stream of literature explores managers' incentives to report earnings that just meet or exceed analysts' earnings forecasts. Bartov, Givoly and Hayn (2002) document that firms meeting or exceeding analysts' expectations enjoy higher stock returns compared to firms that fall short of expectations. Robb (1998) provides evidence that the financial statements of banks are often managed through the use of loan loss provisions to manipulate earnings upwards to achieve analysts' earnings forecasts. Richardson (2000) documents a significant positive association between bid ask spreads and analysts' forecast dispersions (proxies for information asymmetry) and earnings management. These findings indicate that the presence of information asymmetry provides management with incentives to manage earnings.

2.3 Information asymmetry and auditors

Agency theory suggests that the principal-agent relationship is associated with information asymmetry. Managers have incentives to manage earnings when contracts

between a company and other parties are based on accounting results. As previously discussed, the contractual incentives such as maximizing management compensation, complying with debt covenants, ensuring job security, and facilitating union negotiations can all provide possible incentives for managers to manage earnings. Therefore, managers may not want accounting irregularities to be revealed to the board of directors and shareholders (due to a fear of being fired, losing their bonus, or due to the higher costs associated with breaching debt covenants). Managers may also not want accounting irregularities to be revealed to other contracting parties, such as creditors and regulators. The agency costs, caused by information asymmetry and by conflicts of interest, may also provide incentives for the managers to withhold information from the auditors so as to conceal the accounting irregularities. Statements on Auditing Standards (SAS No.1) issued by the Auditing Standards Board (ASB), the senior technical body of the AICPA designated to issue pronouncements on auditing matters, states that:

"The auditor has a responsibility to plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether caused by error or fraud."

A material misstatement resulting from fraud is inherently more difficult for auditors to detect when compared to material misstatements caused by errors. This is because fraud normally involves deliberate concealment and/or intentional misrepresentations. SAS No.1 AU section 230 (Due Professional Care in the Performance of Work) paragraph 12 provides certain characteristics of fraud as such: *"(a) concealment through collusion among management, employees, or third parties; (b) withheld, misrepresented, or falsified documentation; and (c) the ability of management to override or instruct others to override what otherwise appears to be effective controls. For example, auditing procedures may be ineffective for detecting an intentional misstatement that is concealed through collusion among personnel within the entity and third parties or among management or employees of the entity. Collusion may cause the auditor who has properly performed the audit to conclude that evidence provided is persuasive when it is, in fact, false. In addition, an audit conducted in accordance with generally accepted auditing standards rarely involves authentication of documentation, nor are auditors trained as or expected to be experts in such authentication. Furthermore, an auditor may not discover the existence of a modification of documentation through a side agreement that management or a third party has not disclosed. Finally, management has the ability to directly or indirectly*

manipulate accounting records and present fraudulent financial information by overriding controls in unpredictable ways."

If auditors had perfect knowledge about managers' actions there would be no information asymmetry between the two parties. However, information asymmetry exists when perfect information is absent and the presence of such is evident from the audit failures and corporate frauds that have occurred with the likes of Enron, WorldCom and Parmalat, among numerous others. For example, the Enron scandal is often attributed as being the biggest failure by an audit firm to report the signs of doubtful accounting policies. This subsequently led to the demise of one of the 'Big 5' auditing firms, Arthur Andersen. Such big audit failures have brought the auditing profession under intense scrutiny by both governments and regulators concerning the role and quality of audits. This led U.S. policy makers to confront issues related to improving audit quality which subsequently resulted in the enactment of the Sarbanes-Oxley Act 2002 by the U.S. Congress on 30th July 2002. This legislation put in place a new regulatory body, the Public Company Accounting Oversight Board (PCAOB), to oversee the audits of public companies with the aim of protecting the interests of investors, and to further protect the public interest through having more informative, accurate and independent audit reports.

Given managers have incentives to manage earnings, they may conceal, withhold, misrepresent, or falsify documentation. This is because of the information asymmetry that exists between the managers and auditors. If auditors had perfect information about manager's actions, then there would be no information asymmetry between these two parties. Since information asymmetry exists, auditors can have difficulty detecting deliberate concealment and/or intentional misrepresentations. Information asymmetry increases the audit risk and the auditor should respond to higher audit risk by exerting more audit effort, thereby increasing the probability that material misstatements will be detected. Using a sample of Hong Kong publicly listed companies, Gul and Tsui (1998) document that for low growth companies the positive association between free cash flow and audit fees is weaker for those companies with higher debt. That is, debt constrains opportunities for management to engage in perquisites, which in turn reduces the audit effort required, and the subsequent audit pricing of these firms. This supports the theory that agency costs of the company have an effect on the amount of effort supplied by auditors.

As the principal hires the auditor to attest to the accuracy of the financial statements, the auditor also acts as an agent to the principal whilst performing an audit. Therefore, there may be in existence a conflict of interest that can

compromise the auditors' independence. This is because auditors are paid by the firms they audit combined with the need for auditors to maintain a close working relationship with the management of the client firm. This may cause the auditor to shirk, or to simply ignore errors and irregularities (Watts and Zimmerman, 1983). Chow and Rice (1982) provide evidence that companies are more likely to change their auditor after receiving a qualified opinion. They document that these firms that change auditor after receiving a qualified opinion are not more likely to receive an unqualified opinion in the following year from their new auditor when compared to firms that received a qualified opinion and maintained the same auditor. This might be due to the likelihood of an auditor shirking depending not only on the close working relationship with the client but also on the auditor's reputation and perceived litigation risk (DeAngelo, 1981a). Auditors have an incentive to maintain and protect their reputation in order to retain existing clients, and to grow their books by getting new audit work in the future. Auditors also desire to avoid costly litigation. Furthermore, it is generally accepted parties that rely on the audited financial statements have greater confidence that these of these being free from material misstatements when the auditor is a big audit firm. Big audit firms are associated with higher quality audits (DeAngelo, 1981b; Craswell, Francis and Taylor, 1995; Francis, 2004). Francis, Maydew and Sparks (1999) report firms that

hire the services of big audit firms are associated with lower discretionary accruals. The regulatory environment has created a demand for auditing. This is because all publicly traded companies are required to have their financial statements audited by external (independent) auditors. However, if the competition amongst auditors is weak, audit firms may have incentives to shirk, leading to unresolved agency problems, and less informative financial statement quality.

2.3 Proxy for information asymmetry

As the extent of information asymmetry is not directly observable, proxies for the measurement of information asymmetry are utilized. Prior studies have used such variables as firm size (Ball and Kothari 1991), fixed assets, and research and development expenses (Armstrong, Core, Taylor and Verrecchia 2011) as proxies for measuring information asymmetry. Another proxy for information asymmetry is the probability of informed trading (PIN) developed by Easley, Kiefer, O'Hara and Paperman (1996). The Easley et al. (1996) microstructure model estimates the unconditional probability of information-based trading for a given stock based on the observed order flow. Financial analysts use the book to market value ratio to measure

investment and growth opportunities of the firm, and this has also been held to proxy for information asymmetry.

Bagehot (1971) suggests that the bid-ask spread can be well explained by the adverse selection faced by market makers. Following this, Glosten and Milgrom (1985) and Kyle (1985) constructed formal models to test this phenomenon. The practical importance of adverse selection has been confirmed from the results of empirical studies of Glosten and Harris (1988) and Stoll (1989). Stoll (1989) attributes 43 percent of the quoted bid-ask spread to adverse selection components. It is the bid-ask spread along with market depth (the number of investors in the market), that make up the market liquidity. Market liquidity refers to the extent to which investors are able to buy and sell securities in the market. In the finance literature, the bid-ask spread is used as proxy for information asymmetry between buyers and sellers of securities. The percentage of institutional ownership, the number of analyst following (Roulstone 2003) and analysts' forecast (Armstrong et al. 2011; Clement and Tse 2005) have also used as proxies for information asymmetry.

2.4 Analysts' forecast as proxy for information asymmetry

Information asymmetry can be proxied by both analysts' forecast accuracy and analysts' forecast dispersion. These variables were used by Krishnaswami and Subramaniam (1999) and Gilson, Healy, Neo and Palepu (2001) in their studies as proxies for information asymmetry. Blackwell and Dubins (1962) demonstrate that opinions on average tend to converge as the amount of information available about an unknown quantity increases. Elton, Gruber and Gultekin (1984) document that 83.7 percent of the analysts' forecast error for December (the final month of firms' fiscal year end) consists primarily of firm-specific information rather than economy or industry wide factors. These authors also show that analysts' forecast error reduces as the fiscal year ends arguing that this is because information asymmetry is lower and the accuracy of available information is higher at that time. Barry and Brown (1985) show that when the availability of public information increases, the divergence of analysts' beliefs tend to converge. Barry and Jennings (1992) provide evidence that forecast dispersion can be attributed to differences in the private information that is in the possession of analysts. Brown, Richardson and Schwager (1987) show that the superiority of analysts' forecasting ability compared to time-series models are positively related to both the amount of information available (proxied by firm size), and the precision of this information (proxied by the dispersion in analysts' forecasts).

Based on a U.S. sample of 5,282 annual earnings announcements made between 1980 and 1989, and using both analysts' forecasts dispersion and range as proxies for information asymmetry, Altiese and Bamber (1994) find that firms with higher levels of information asymmetry between managers and market participants in terms of firm's cash flows tend to have higher forecast errors. Analysts' forecasts reduce information asymmetry in the market and are, as such, adopted as a proxy for measuring information asymmetry. Analysts' forecast accuracy and forecast dispersion have also been used proxies for information asymmetry by Lang and Lundholm (1996) who find that firms with more informative disclosures have more accurate analysts' earnings forecasts, and have lower dispersion among the individual analysts' forecasts. High dispersion implies low consensus among analysts' forecasts, and is taken as an indication of high information asymmetry.

Barron, Kim, Lim and Stevens (1998) document that analysts' forecast accuracy and dispersion are affected by both uncertainty and consensus among analysts (information asymmetry) about the firm's future cash flows. More importantly, these authors show that analysts' forecast dispersion is a measure of analysts' idiosyncratic uncertainty and therefore does not capture total earnings uncertainty. These authors point out that decreases in analysts' forecast dispersion

may not signal a decrease in total uncertainty but rather a decrease in the uncertainty related to the idiosyncratic component of analysts' forecasts. Barron et al. (1998) assume that public information is the same across all analysts. This is consistent with the SEC intention of levelling the informational playing field in enacting the Regulation Fair Disclosure in August 2000 (effective in October 2000) to level information asymmetry across analysts. Stickel (1990) documents that analysts revise their forecasts immediately after earnings announcements are made. Barron, Byard and Kim (2002) show that the idiosyncratic information contained in individual analysts' forecasts increases immediately after earnings announcements. Ivkovic and Jegadeesh (2004) show that forecast revisions immediately following earnings announcement are mainly based on analysts' revised interpretations of newly released information. All of these findings suggest that analysts update their forecasts shortly after earnings announcements and that their latest forecasts reflect the new information that has been released.

Krishnaswami and Subramaniam (1999) argue that analysts' forecast dispersion represents the disagreement among analysts about estimates of the firms' earnings which indicates a lack of available information about the firm. Healy and Palepu (2001) argue that financial analysts engage in private information production

to uncover managers' superior information which facilitates corporate monitoring. Financial analysts are more superior compared to average investors in tracking firms' financial statements, interacting directly with management, and raising questions about different aspects of financial reporting achieved through conference calls. This superiority is due to their enhanced training in finance and industry background knowledge. By studying the discretionary accruals in earnings reports of firms with earnings-based bonus plans, Kim and Schroeder (1990) attribute security analysts' forecasting accuracy to their ability to incorporate relevant information other than that included in the historical earnings of a firm. Mikhail, Walther and Willis (1997) find that analysts' forecast error is positively associated with their firm specific experience. This is consistent with analysts learning over time. These authors also document that experienced analysts' forecast errors are more closely related to the market reaction around earnings announcements than the forecast errors of less experienced analysts. Using analysts' forecast data from the Institutional Broker Estimate System Detail History tape, Clemet (1999) documents that forecast accuracy is positively associated with analysts' experience and employer size (a surrogate for resources), and negatively associated with the number of firms and industries followed (surrogates for portfolio complexity) by the analyst. Frankel, Kothari and Weber (2006) document that market participants view analysts' activities as increasing the information

efficiency of security prices because of their expertise and knowledge in firm valuation.

Using individual analysts' forecast of quarterly and annual earnings per share from the Institutional Brokers System Detail History tapes from 1984-2001, Richardson, Teoh and Wysocki (2004) provide an-incentive based explanation (managers' personal incentives) that suggests analysts are guided downward to beatable targets so that there is a price increase in response to positive news. These authors document evidence that managers systematically guide analysts towards beatable targets, reflecting the fact that there is information asymmetry between managers and analysts. From a sample of 216 cases of U.S. corporate frauds for the period 1996-2004, Dyck, Morse and Zingales (2010) document that financial analysts have played a key role in the discovery of corporate fraud. These authors provide evidence that analysts have the ability to reduce the information asymmetry between managers and analysts.

From the discussion above, it is evident there are three components in the information asymmetry of analysts' forecast:

(1) that which exists between firm's managers and analysts,

(2) that which exists among the analysts, and

(3) that which pertains to uncertainty of the firm's future cash flows.

In this study, I use analysts' forecast accuracy and forecast dispersion as two proxies for inherent risk. This is because these are earnings-related and the analyst's forecast itself reflects the information difference between managers and the analysts. I argue in this study that it is both the informational and monitoring role of analysts that may affect the auditors' assessment of inherent risk and/or control risk. This in turn, is likely to impact the auditors' decision as to whether to deploy greater resources in order to reduce detection risk so as to achieve an acceptable level of overall audit risk. The deployment of increased effort in achieving this will be reflected in the audit fee charged. As far as this measure captures the extent of information asymmetry between managers and analysts, analysts' forecasts (accuracy and dispersion) should well proxy for inherent risk in this study.

This thesis first experimental variable is the lag of analysts' forecast accuracy (*LAGAACY*), which is the analysts' forecast accuracy in the previous fiscal year (year t-1). I use the lag of forecast accuracy to reduce the possibility of reverse

causality, and also to address this thesis research question as to whether auditors rely on the analysts' work in their assessments of the inherent risk of their clients. If the auditors rely on work of the analyst in their assessments of inherent risk, then this reliance should be based on the analysts' forecasts for the previous fiscal year. This is because the current fiscal year earnings are currently being audited and would not at that stage be finalized. Behn et al. (2008) provide evidence that firms with financial statements audited by Big 5 auditors are associated with better forecast accuracy than those audited by non-Big 5 auditors. Analysts' forecast accuracy is measured by the negative of the absolute value of forecast error scaled by stock price at time *t-1*. This measurement is in line with studies by Lang and Lundholm (1996) and Behn et al. (2008). For robustness, I replace the *LAGAACY* variable with the lag of analysts' forecast dispersion (*LAGDSP*) which is the dispersion of analysts' forecast in the previous fiscal year (year t-1). Dispersion of analysts' forecast is defined as the standard deviation of earnings forecasts issued by individual analysts. This measurement is also in line with the studies by Lang and Lundholm (1996) and Behn et al. (2008).

2.5 The audit risk model

Statement on Auditing Standards (SAS) No.107 issued by the Auditing Standards Board (ASB) provides guidance on what the auditors need to consider in relation to both audit risk and materiality when planning and performing an audit of financial statements. Audit risk, as stated in SAS No.107 is *"the function of the risk that financial statements prepared by management are materially misstated and the risk that the auditor will not detect such material misstatement"*. The audit risk model is stated as follows:

Audit Risk = Inherent Risk X Control Risk X Detection Risk

It is the product of the likelihood that environmental factors will produce material error (inherent risk), the likelihood that the internal controls system will not prevent or detect a material error (control risk), and the likelihood that the audit procedures undertaken will fail to detect material errors that have not been detected by the control system (detection risk). Both the inherent risk and the control risk are considered by the auditor and based on an assessment made by the auditor of the client. This occurs in every audit engagement. In assessing control risk, the auditor develops a preliminary understanding of the client's internal control system and depending on the auditor's assessment of the client's internal control system, the

auditor makes a choice as to how much reliance can be placed on the client's internal control system. If the auditor decides to rely on the client's internal control system, tests of controls are performed on the relevant controls to determine whether the internal control procedures are operating as planned. The greater the inherent risk and/or control risk, the more resources the auditor will have to expand in performing the audit to reduce the level of detection risk so as to achieve an acceptable level of overall audit risk. The audit risk model is designed to help auditors understand and manage the risks associated with getting it wrong and, in doing so, issuing an unqualified audit opinion on financial statements that contain undetected material misstatements.

SAS No. 109 indicates that the auditor's understanding of the entity and its environment extends beyond the accounting and financial aspects of the entity. Whilst the auditing standards do give direction regarding the need to use many sources in gaining an understanding of the client, they do not specifically suggest using the work of analysts directly. However, it is considered reasonable to expect that auditors may indeed use analysts' forecast accuracy and dispersion, when available, and that such information may be useful to auditors in the risk assessment of their client. This is consistent with theory that analysts, like other important

financial intermediaries, provide useful information to other third parties, including auditors.

2.6 Analyst and auditor's risk assessment

It is not only considered reasonable that auditors may use analysts' forecast accuracy and dispersion in their assessment of clients' risk, I suggest that auditors should utilize work undertaken by analysts for two reasons which are inter-related. First, it is essential that auditors take all relevant information into consideration when identifying areas of risk where there is a likelihood that material misstatements could exist. This starts with an auditor gaining a good understanding of the clients' business which includes knowledge of operations, customers, suppliers, lenders, managements' expertize, experience, and incentives amongst various other things to consider. That is, auditors seek information to enable them to identify anything that could lead to, or increase, the likelihood that management may misstate the financial statements. Second, it has been well identified in the literature [e.g. see Bartov et al. (2002) and Robb (1998)] that there is an association between firms meeting or exceeding analysts' expectations and earnings management. That is, analysts' forecast estimates may provide incentives for

management to manipulate financial statements given the often adverse stock market reaction (and share price movement) for firms that even marginally fail to meet earnings expectations. Consequently it is argued that auditors will consider the impact analysts' forecast estimates for any firms that have analyst coverage.

There are at least two other reasons to expect financial analysts to influence auditors' risk assessment. The first reason is the information role of analysts as being financial intermediaries in that they provide useful information to third parties. Analysts can uncover private information as argued by Healy and Palepu (2001) who suggest that financial analysts engage in private information production to uncover managers' superior information which, in turn, facilitates corporate monitoring. By studying the discretionary accruals in earnings reports of firms with earnings-based bonus plans, Kim and Schroeder (1990) attribute security analysts' forecasting accuracy to their ability to incorporate relevant information that is additional to that included in the historical earnings of a firm. This informational role of analysts should help auditors to gain a better understanding of their client's business and, as such, this is likely to affect the auditor's risk assessment of their clients.

Second, it is argued that the monitoring role of analysts can result in enhancing the overall corporate governance of auditor clients. This potentially can also affect the auditors' control risk assessment. Healy and Palepu (2001) argue that financial analysts engage in private information production to uncover managers' superior information which facilitates corporate monitoring. Yu (2008) suggests that it is the analysts' monitoring role that reduces managers' incentives to engage in opportunistic earnings management.

Lang, Lins and Miller (2004) provide evidence that scrutiny by analysts increases corporate transparency and as a consequence, makes it more difficult for managers to engage in self-dealing activities, such as asset transfers, excessive compensation and perquisite consumption. Therefore, it is argued that both the informational and monitoring role of analysts that may affect the auditors' assessment of inherent risk and/or control risk. This in turn, is likely to impact the auditors' decision as to whether to deploy greater resources in order to reduce detection risk so as to achieve an acceptable level of overall audit risk. The deployment of increased effort in achieving this will be reflected in the audit fee charged.

2.7 Audit fee model

Empirical testing using the audit fee model originated with Simunic (1980), who developed a supply side model of audit fees. Simunic suggests audit fees are a function of client size, complexity and risk and models the cost of internal accounting systems (including internal audit) and external auditing as being a part of the financial reporting system. He argues the economic decision of a firm's management is to maximize its own expected profits each period by minimizing the total cost of the external financial reporting system, the sum of auditee effort, the external auditor effort, and the auditee's exposure to potential loss. Simunic (1980) argues the audit fee is both a function of auditor effort and perceived audit risk, and that audit risk is a function of both the auditor's exposure to potential risk and the residual risk to the auditor.

Houston, Peters and Pratt (1999) provide a detailed discussion on the linkage between Simunic's (1980) audit pricing model and the previously discussed audit risk model (AICPA 1983). These authors provide evidence that when the probability of misstatement is high, due to irregularities, business risk dominates the audit risk model in the explanation of the audit planning, and that the audit fees contain a risk

premium. The risk premium implies that more resources have to be deployed in order to reduce the audit risk to an acceptable level to the audit firm.

Simunic (1980) did not employ the more recently developed approach of regressing the logarithm of audit fees against a set of control variables, but instead constructed his dependent variable by scaling the raw audit fees by the square root of assets, and then regressing that measure against a set of control variables. Francis (1984) extended this line of study by adapting the audit fees model so as to have the logarithm of audit fees as the dependent variable. This has become the accepted standard in the literature concerning audit fees. Francis (1984) suggests that Simunic's (1980) regression model in using the deflated audit fees by the square root of assets to control for size effects violates a regression assumption of constant variance and normally distributed residuals. Since Simunic's (1980) seminal study of audit fees, there have been many studies that have used different and an increasing number of explanatory client and auditor attributes in order to test their associations with audit fees. When the coefficients of experimental variables have found to be significant, the hypothesized relationships between the experimental variables and audit fees generally have been deemed to exist, and subsequently

included in later studies. This has resulted in an increasing number of explanatory variables being included in the audit fees model since Simunic's (1980) initial study.

Simunic (1980) found evidence that large auditors discount audit fees which he attributed to economies of scale. However, subsequent studies, such as those by Palmrose (1986), and Simon and Francis (1988) have documented a price premium being paid to big audit firms and attribute this premium to a higher audit quality provided.

DeAngelo (1981b) was possibly the first study that investigated audit quality. She defined audit quality as being the joint probability of both detecting and reporting material financial statement errors. She argues that auditor size is a surrogate of audit quality and that large auditors are perceived by users of financial statements to be of higher quality. Her arguments are based on the idea that investments in audit technology by audit firms provide incentives for auditors to choose the level of audit quality that they provide. DeAngelo (1981b, p.187) suggests "*When audit technology is characterized by significant client-specific start-up costs, incumbent auditors possess cost advantages over potential competitors in*

future audits of a given client. Even when the initial market for audit services is perfectly competitive insofar as all auditors possess identical technological capabilities, these advantages to incumbency imply the absence of perfect substitute auditors in future periods. These absent of perfect substitutes enable incumbent auditors to set future audit fees above the avoidable costs of producing audits, i.e., incumbent auditors earn client-specific quasi-rents." These quasi-rents, when they are subject to loss due to the discovery of a lower quality audit than promised, serve as collateral against opportunistic behavior by auditors. An example would be an auditor's incentive not to report a breach in the client's records due to the client threatening to terminate the auditor's service in future. DeAngelo (1981b, p.191) further argues that "*when client-specific quasi-rents are identical across clients of a given auditor, auditors with a greater number of current clients supply a higher level of audit quality, because their total collateral is greater*." However, these arguments implicitly hold constant internal organizational structure and incentives. She does admit that the agency costs can vary with auditor size. For example, moral hazard problems arise when audit partners are unable to monitor directly whether their staff have actually carried out the entire audit procedures that they claimed to have completed. Following this study, many researchers documented that audit fees are increasing in with auditor size. This suggests that large auditors provide higher

audit quality (Francis, 1984; Palmrose, 1986; and Craswell et al., 1995). Another line of argument in support of large auditors providing higher audit quality is that developed by Dye (1993). Dye (1993) develops an analytical model in which the perceived audit quality is related to the auditor's wealth. The argument suggests that if an auditor decides not to perform up to a required standard of audit quality, then the auditor will lose all his wealth if a violation is detected. Since the large auditors have more wealth, they provide higher audit quality because they have more at stake (deep pocket hypothesis). This increases the auditors' incentives to provide higher quality audit work so as to reduce their litigation exposure and preserving their reputation capital. Lennox (1999) and Shu (2000) document evidence that is consistent with this hypothesis. Lennox (1999) provides evidence that big audit firms issue reports which are more accurate and include more informative signals of financial distress than smaller audit firms in their audit reports.

Hay, Knechel and Wong (2006) conduct a meta-analysis on the determinants of audit fee studies from 1977 to 2003 and summarize attributes impacting audit fees in order of importance: (1) size, (2) complexity, (3)inherent risk, (4) profitability (5) leverage, (6) form of ownership, (7) internal control, (8) governance, (9) industry, (10) auditors quality, (11) auditor tenure, (12) auditor location, (13)

report lag, (14) whether the audit is perform in a busy season, (15) audit problems encountered, (16) the provision of non-audit services, and (17) reporting requirements of that a client has to satisfy.

1) Size of client

The auditing procedures adopted by audit firms are primarily based on sampling and, as such, a larger sized client will require larger sample sizes to be being taken in performing the audit. The demand for audit effort to be expended is likely to increase with larger sized clients due to more resources being required to audit larger firms. This leads to a positive association between client size and audit fees (Simunic 1980). The size of client is the most dominant determinant and generally explains more than 70% of the variation in the audit fees. Ninety-seven percent of studies reported a significant positive association between audit fees and client size (Hay et al. 2006). In this study, the control variable for client size is *LNAT* (the natural logarithm of assets). The inclusion of this control variable is in line with the vast majority of the audit fees studies.

2) Complexity of client business operations

Client complexity has a positive and significant association with audit fees in 81 percent of the reported results according to the Hay et al. (2006) findings. As a proxy for the complexity of a client's operations, one commonly used variable is the number of different subsidiaries (or client locations). A client having such operations adds to the complexity in performing the audit as it may require on-site visits by the auditors, and the more time and effort should be required by the auditor in performing the audit (Simunic 1980). This results in a higher audit fees being charged. Increases in complexity can also be directly interpreted as a factor contributing to an increased demand for monitoring. I include the following four variables (1) *LNSEG* (natural logarithm of number of business segments), (2) *INVREC* (inventory and receivables to assets ratio), (3) *FOREIGN* (a dummy variable having a value of '1' if foreign currency translation is greater than zero, and '0' otherwise), and (4) *MERGER* (a dummy variable having a value of '1' if firm was involved in merger activity, and '0' otherwise) to proxy for the complexities of client's business operations. These variables have been used in prior studies and have been shown to be significant determinants in explaining audit fees. The more complex the firm structure, the more demanding it is to conduct an audit, therefore higher audit fees are expected to be associated with more complex firms.

3) Inherent risk / client's risk characteristics

Audit risk is considered an important factor in determining the audit fees. Audit risk measures the risk of an auditor unknowingly issuing an unqualified judgment on materially misstated financial statements (SAS No.47). It is the product of the likelihood that environmental factors will produce material error (inherent risk), the likelihood that the internal control system will not prevent or detect a material error (control risk), and the likelihood that the audit procedures undertaken will fail to detect material errors that have not been detected by the control system (detection risk). Both the inherent risk and the control risk are considered by the auditor and based on an assessment made by the auditor of the client. This occurs in every audit engagement. In assessing control risk, the auditor develops a preliminary understanding of the client's internal control system and depending on the auditor's assessment; the auditor makes a choice as to how much reliance can be placed on the client's internal control system. If the auditor decides to rely on the client's internal control system, tests of controls are performed on the relevant controls to determine whether the internal control procedures are operating as planned. The greater the inherent risk and/or control risk, the more resources the auditor will have to expend in performing the audit to reduce the level of detection risk so as to achieve an acceptable level of overall audit risk. The audit risk model is designed to

help auditors understand and manage the risks associated with getting it wrong, and issuing an unqualified audit opinion on financial statements that contain undetected material misstatements.

Inherent risk is expected to have a positive association with audit fees because the auditors respond to higher inherent risk by exerting more audit effort in order to increase the probability of detecting material misstatements (Simunic and Stein, 1996). Simunic (1980) suggested receivables and inventories are two areas that represent high risk to auditors. Hay et al. (2006) found that 71 percent of the studies report a significant positive association between audit fees and both receivables and inventories.

In this study, the variable *QUICK* (current asset minus inventories, divided by current liabilities) measures the level of client liquidity and is expected to be negatively associated with audit fees. A lower quick ratio indicates that the firm is riskier because the firm is at a greater risk of being unable to repay its current liabilities in the next accounting period with such firms associated with higher audit fees.

4) Client profitability

Client profitability was identified by Simunic (1980) as being another measure of risk because it reflects the extent to which the auditor may be exposed to loss in the event that a client is not financially viable. It is expected that the association between audit fees and client's reported net income will be negative because as a client's financial performance becomes worse, the auditor is subject to higher risk and higher audit fees are expected. This is the risk that a client firm may not be a going-concern in the future. In order to reduce the detection risk to achieve a given level of acceptable audit risk, the auditor needs to devote more resources to the audit, and hence charges a higher audit fee. The Hay et al. (2006) meta-analysis study reports a significant negative association between a firm's profitability and audit fees charged. The control *ROA* (return on assets) is included as a proxy for profitability in this thesis.

5) Leverage

Leverage is another measure of risk. Higher leverage is associated with a higher probability of corporate failure. This, in turn, increases auditor litigation risk. For firms that are highly geared the auditors will exert more audit effort and, hence

these firms will be associated with higher audit fees (Simunic and Stein, 1996). On the other hand, leverage can possibly reduce agency conflicts between managers and shareholders (Jensen and Meckling 1976; Grossman and Hart 1981). Based on such agency arguments, Gul and Tsui (1998) and Gul and Goodwin (2010) provide evidence that firms with relatively more leverage are likely to be associated with lower risk of material misstatement. This implies lower audit risk and, as such auditors charge lower fees as they are likely to expend less audit effort for such firms. I include the control variable *LEVERAGE* (total liabilities divided by total assets) to proxy for litigation risk. The meta-result of Hay et al. (2006) finds a significant positive association between audit fees and the leverage ratio. However, these authors point out there are a relatively large number of insignificant results reported in prior studies regarding the association between leverage and audit fees. This may be due to the alternative explanations having an off-setting effect as discussed previously.

6) Form of ownership of the firm

The form of ownership may determine the extent of managerial monitoring which will have an effect on agency costs, and perceived risk of the organization.

Several studies have included the form of ownership. Hay et al. (2006) suggest that the most common proxy for ownership differences include the use of a dummy variable of (1) public versus private companies, (2) stock versus mutual companies, and (3) the existence of major shareholders. The strongest results that these authors report were public versus private companies. The results for stock versus mutual companies were found also to be significantly positive, and the major shareholding variables showed mixed results. As all companies in this thesis sample data set are listed companies, the public / private partition does not apply.

7) Internal control

The audit risk model considers that the internal controls of a company are an important factor in evaluating audit risk. Sections 302 and 404 of the Sarbanes-Oxley Act 2002 (SOX) deal with the effectiveness of the system of internal controls. Section 302 requires that all U.S. public companies' signing officers design, implement and maintain appropriate internal controls. Furthermore, they are required to evaluate the effectiveness of their internal controls on a quarterly basis. Section 404 requires management of the publicly traded companies to report on the effectiveness and procedures implemented concerning internal controls over

financial reporting (ICOFR) on an annual basis. In addition, section 404 requires external auditors to test and provide an independent opinion on the ICOFR effectiveness, including the managements' assessment process. Section 404 became effective for most U.S. companies for the fiscal year ending on or after November 15 2004 for all accelerated filers. Accelerated filers are those firms with a market capitalization of US$75 million or more. Auditors are thus required to extensively consider their clients' internal controls in order to comply with SOX, and to identify the risks that may affect their attestation of the financial statements. The identification of serious weaknesses in internal controls is likely to lead to changes in the audit procedures undertaken and the pricing of the audits (Raghunandan and Rama, 2006).

8) Corporate governance

Shleifer and Vishny (1997, p.737) define corporate governance as "*the way in which suppliers of finance to corporation assure themselves of getting a return on their investment*". Corporate governance refers to the structures and processes for the direction and control of companies. It deals with the relationships among the shareholders and accountability of individuals through a mechanism that reduces the

agency problems due to the separation of ownership and control. The agency problem allows managers to extract private benefits such as the consumption of perquisites, plush officers, and an adversity to risk. This will eventually lead to the firm performing worse. Good corporate governance can reduce the agency problems by placing the balance between ownership and control. The association between audit fees and corporate governance are conflicting in the research. Carcello, Hermanson, Neal, and Riley (2002) find good governance, proxied by a higher proportion of independent directors on the board, leads to higher audit fees being charged. These authors argue this is due to the directors demanding a higher quality audit to preserve their reputation and to avoid litigation risk. Tsui, Jaggi and Gul (2001) find that firms with good governance, proxied by not having CEO duality, are associated with lower audit fees. This could be due to: (1) stronger internal governance reducing the auditor's perceived risk, or (2) the stronger governance leading to a demand for higher audit quality in the form of more independent directors which increases auditor effort, and thus leads to them charging a higher fee. This study does not include corporate governance variables such as the presence of CEO duality, board size, the proportion of independent directors, etc. given that this is not the focus of this thesis. It is considered that this study could be further

explored by considering various corporate governance measures and how these impact on analysts' forecast estimates and audit fees.

9) Industry

There is some evidence that audit fees may be affected by the industry of the client. This could be due to the differences in perceived risk from the audit standpoint, as well as differences in audit procedures required when auditing clients from different industries (Fung, Gul and Krishnan 2012). To control for industry effects, I construct 48 industry dummies by using the firm's 4-digit SIC industry code developed by Fama and French (1997).

10) Audit quality

To capture the effect of differences that may exist in audit quality between auditors, I include *BIGN* (a dummy variable having a value of 1 if firm is audited by all of the Big audit firms i.e. PricewaterhouseCoopers, Ernst & Young, Deloitte Touché Tohmatsu, KPMG and Arthur Anderson). Simunic (1980) posited that larger audit firms (*BIGN*) charged lower relative audit fees due to economies of scale enjoyed by the largest suppliers within a market of differentiated services. In

contrast, others have argued and their results support that larger audit firms charge higher audit fees either because of their monopolistic power, or more likely to reflect the higher quality audit that these firms provide (Palmrose 1986; Francis and Simon 1987). In line with previous studies, it is expected that *BIGN* will be positively associated with audit fees.

11) Initial audit / tenure

One major issue faced by auditors is the need to maintain their independence while maintaining a business relationship with their clients. Their work may be impaired by the pressure from their clients, who is the party that pays the audit fee for the service rendered by the auditor. DeAngelo (1981a) documents that auditors sometimes charge lower audit fees (below cost) to obtain new clients with the expectation of their recouping these initial losses in later years of audit engagements. This she called ‘low balling’. Gul, Jaggi and Krishnan (2007) suggest that auditors with short tenure may be more accommodating to their clients in the early years so as to develop their relationship such that they can retain the job long enough to recoup the initial losses caused by low balling. This would result in lower audit quality if their independence is affected by this. The rise in accounting irregularities

has prompted the regulators to express concerns pertaining to audit firm tenure and how long client associations may impact on independence and audit quality. This has brought about suggestions to place limits on audit tenure. The stipulation of length of a term that an auditor-client relationship can exist is called mandatory audit-firm rotation. This has been considered as a way of improving the quality of financial reporting. On the other hand, the accounting profession has argued that having mandatory audit rotation and placing a limit on the extent of permissible relationship would likely increase audit start-up costs and increase the risk of audit failure. This is because the incoming auditor places increased reliance on the client's estimates and representations in the initial years of an engagement. Although the auditor may have the auditing expertise, they may lack the specific knowledge about the new client in the initial years of audit engagement. Berton (1991) provides evidence that a great proportion of audit failures occur in the early years of audit engagements. Palmrose (1987) also shows that auditors' litigation risk is greater in the initial years of audit work. Myers, Myers and Omer (2003) provide evidence that extended audit tenures are not detrimental to financial statement quality. Their results show a negative association between audit tenure and the extent of discretionary accruals. These authors suggest that audit quality will not deteriorate with increase in audit tenure. To control for the lower fees associated with the

practice of low balling in initial engagements, I include the control variable *INITIAL* (a dummy variable having a value of '1' and '0' otherwise if the auditor tenure is less than 2 years) in line with studies by Whisenant, Sankaraguruswamy and Raghunandan (2003) and Hogan and Wilkin (2008).

12) Other control variables

LOSS (a dummy variable having a value of '1' and '0' otherwise if net loss is reported) is usually expected to be positive in association with audit fees as found in prior studies. This is because auditors consider loss-making firms to be of greater risk of being able to continue their operation in the future. A positive coefficient is also expected for *OPINION* (a dummy variable having a value of '1' and '0' otherwise if nonstandard audit report is issued) in line with prior studies that document higher audit fees are associated with firms that have previously received modified opinions. This is possibly due to more investigative efforts being rendered by the audit firms when this has occurred. In addition, to control for the client's internal control system, I include the control variable *SALESGRWTH* (measured as the percentage change in sales from previous year to current year). Stice (1991)

argues that the effectiveness of the client's internal control system should be altered as the client's sales level increases and this will affect the perceived audit risk.

2.8 Model and hypothesis

Consistent with the empirical literature on audit fees, as previously discussed, the following regression model is employed for testing the hypotheses in this study. The regression equation is specified as follows:

Model 1:

$$LAF = \beta_0 + \beta_1 LNAT + \beta_2 LNSEG + \beta_3 INVREC + \beta_4 QUICK + \beta_5 LEVERAGE + \beta_6 ROA + \beta_7 SALESGRWTH + \beta_8 FOREIGN + \beta_9 MERGER + \beta_{10} YE + \beta_{11} LOSS + \beta_{12} OPINION + \beta_{13} BIGN + \beta_{14} INITIAL + \sum year + \sum industry + \varepsilon_1 \quad (1)$$

From the literature, it is evident there are three components that relate to information asymmetry concerning analysts' forecast and dispersion: (1) that between firm managers and analysts, (2) that between the analysts, and (3) that pertains to uncertainty inherent in the firm's future cash flows. In this study, I use analyst forecast accuracy and forecast dispersion as proxies for inherent risk which is in line with the previously discussed literature on information asymmetry. As far as these

measures capture the extent of inherent risk, I posit the audit firms will perceive lower inherent risk when analysts' earnings forecasts are more accurate and will subsequently charge lower audit fees. Similarly, greater analysts' forecast dispersion will be perceived by the audit firm as being associated with higher inherent risk, given a higher extent of information asymmetry, and will be associated with higher audit fees. This leads to the first set of hypotheses which are formally stated as follows:

H1a: *There is a negative association between audit fees and analysts' earnings forecast accuracy, ceteris paribus.*

H1b: *There is a positive association between audit fees and analysts' earnings forecast dispersion, ceteris paribus.*

2.9 Information asymmetry and firm size

Prior literature suggests that there are greater amounts of information available for larger firms compared to smaller firms. This is due to there being more analysts following, higher levels of institutional ownership, and greater news coverage of larger firms (Atiase, 1985; Grant, 1980; Collins, Kothari and Rayburn, 1987; Freeman, 1987; Bhushan, 1989). The higher amount of public information that is available covering these firms reduces the amount of private information held. This is because the amount of information about a given client at any given time is finite. Additionally, larger firms are predominantly more likely to be audited by Big audit

firms. All of the Big-audit firms are international and have their head offices in the U.S. (Ferguson, Francis and Stokes, 2003; Fung et al. 2012). Similarly, Fan and Wong (2005) find that higher agency problems affect the likelihood of companies employing big brand name auditors. The literature has been consistent that Big audit firms charge higher audit fees and are associated with providing a comparatively higher quality audit. These audit firms carry a higher litigation risk in the U.S. compared to those in other jurisdictions (see Francis (2004) for a discussion on this). Given the higher quality of financials reported by larger clients audited by Big auditors, it is reasonable to expect that these larger firms should be associated with lower levels of information asymmetry.

The extent of information that is available may vary between large and small firms. This is primarily due to the differential incentives for information searches between these two firm types. As long as the marginal profit earned from information search is greater than marginal costs of performing information searches, interested parties will search for information about a particular firm and trade on its security with the objectives of making a profit. Atiase (1985) argues that expected marginal profit from information search is increasing in firm size. This is because there are more incentives to undertake information search for large firms compared to small firms. Intuitively more information is available for larger firms compared to smaller firms.

Freeman (1987) argues that the press and analysts have incentives to focus on large firms because these firms are more widely held which stimulates the interest of investors. Atiase (1985) provides evidence that the Wall Street Journal publishes more information concerning larger firms than smaller firms. Arbel, Carvell and Strebel (1983) argue that analysts concentrate their activities on larger firms. Piotroski and Roulstone (2004) suggest that higher analyst following is associated with more trading by privately informed investors, which in turn, implies that for larger firms lower information asymmetry may exist. Consistent with theory that small firms (in terms of asset size), have higher informational problems, I posit that for such firms the association between forecast accuracy (and dispersion) and audit fees will be stronger. That is, higher analyst forecast accuracy is expected to be associated with lower audit fees, with greater dispersion for these firms will be associated with higher audit fees. This is because there is less information available for these firms, including less analyst following. The higher extent of information asymmetry present in these firms will make these firms inherently more risky as perceived by their auditors. It is posited that the presence of higher forecast accuracy by analysts for these firms will be informational to auditors, given that there is comparatively less information publicly available concerning them, and this will lead to a reduced perception of risk, and subsequent lower audit fees. For the same reasons, higher dispersion for these firm types will lead auditors to perceive higher risk leading to a comparatively higher audit fee.

To investigate the effect of small and large firms on the association between audit fees and analyst earnings forecast (accuracy and forecast dispersion), the sample is split into small and large firms at the median in terms of the value of the firms' total

assets. In line with the argument that smaller firms have higher informational problems, auditors are more likely to use analysts' forecasts in their assessment of inherent risk when auditing smaller sized clients.

The second set of hypotheses relating to the effect that firm size plays are formally stated as follows:

H2a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for smaller firms, ceteris paribus.*

H2b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for smaller firms, ceteris paribus.*

2.10 Information asymmetry and firm age

Further tests to be performed focus on whether differences exist concerning information asymmetry between older and younger firms. A firm's age can be considered as a proxy for information asymmetry between managers and investors, and can also proxy for the amount of information that is available about the firm (Ecker, Francis, Kim, Olsson and Schipper 2006). As firms grow older, more information is available both due to the availability of a longer data history, and because of expanded analyst coverage over time. Previous research has provided evidence that information asymmetry problems reduce as firms become older due to these firms developing a history in the capital market (Pittman and Fortin, 2004).

Lang (1991) finds that the size of share price reactions to earnings announcements decrease as firms age. Hadlock and Pierce (2010) show that the age of firms is inversely related to the presence of financial constraints. This implies that older firms have lower information asymmetry. In line with this, Diamond (1989) suggests that young firms have higher moral hazard problems. Pittman and Fortin (2004) provide evidence that younger firms employing the services of Big audit firms are associated with lower borrowing costs. These authors argue that this is because the higher quality associated with Big audit firms reduces the information asymmetry that is associated with younger firms. Based on these arguments that younger firms have higher information asymmetry, I posit that auditors of younger firms are more likely to use the analysts' earnings forecast in their assessment of inherent risk. It is expected that the negative association between audit fees and analysts' forecast accuracy will be more pronounced for younger firms than older firms. It is also expected that the positive association between audit fees and analysts' forecast dispersion will be more pronounced for younger firms than older firms. To evaluate the effect of young and old firms on the association between audit fees and analysts' earnings forecasts, the sample is split into quartiles based on the number of years since the firm's inclusion on the CRSP database. Young firms are those in the lowest quartile, and old firms are those in the highest quartile.

The third set of hypotheses are formally stated as follows:

H3a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for young firms, ceteris paribus.*

H3b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for young firms, ceteris paribus.*

2.11 Information asymmetry and auditors' industry specialization

The ability of auditors to perform an audit effectively and efficiently depends on both the auditors' client-specific knowledge, and the auditors' expertise in the client's industry. Research on auditors' industry expertise indicates that client firms engaging auditor industry specialists are associated with a higher quality of financial reporting. This is because these specialist auditors appear to have developed a better understanding of industry trends and accounting practices learned from their experience gained from performing their previous audit engagements (Maletta and Wright 1996). Wright and Wright (1997) provide evidence that auditor industry specialists generate more persuasive hypotheses in the planning phase, which leads to them being able to better identify industry-specific errors. Taylor (2000) reports that banking industry specialist auditors are more confident in their inherent risk assessments compared to those auditors that are not banking industry specialists. This ability comes from their experience in serving other clients in the same industry and applying the best practices in auditing across the industry. The

more audit work done in a given industry, the more knowledge gained about the industry, thus the higher audit quality provided by these specialist auditors. Kwon (1996) argues that audit firms with industry specialization can better assess the reasonableness of client's estimates and other financial representations, thereby reducing the client's discretion in applying accounting principles, and thus improving the financial statement and audit quality. Simunic and Stein (1987) argue that the higher quality audits performed by industry specialists can be attributed to the fact that these audit firms invest in technologies, physical facilities, personnel, and organizational control systems that improve the quality of audit work (i.e., detect irregularities and misrepresentation more easily), that is carried out by the specialist audit firms within the focal industries.

A higher audit quality increases the probability that the financial statements reflect more accurately the financial position and results of the clients' operations. Having auditor industry specialists should result in lower information asymmetry. This is because industry specialists have superior knowledge about their particular industry. Additionally, they are concerned about retaining their reputation for providing higher quality audits. As such, the association between audit fees and forecast accuracy (and forecast dispersion) is expected to be weaker for auditor industry specialists compared to auditor non-industry specialists. On the other hand, auditor industry specialization may provide an opportunity for the audit firms to

increase the profitability of the audit firm by charging higher audit fees with little or no effect on audit quality or information asymmetry. Craswell et al. (1995) and DeFond, Francis and Wong (2000) provide evidence that auditor industry specialists charge fee premiums.

It is posited that industry specialist audit firms with superior knowledge about the industry upon which they have expertise, compared to industry non-specialist audit firms, will be less likely to use the analysts' earnings forecast in their assessment of inherent risk. It is expected that the negative association between audit fees and analysts' forecast accuracy will be stronger in the presence of non-industry auditor specialists. That is, the extent of lower inherent risk perceived from more accurate analysts' forecasts, and the subsequent impact that this has on audit fees, will be more pronounced when the audit firm is non-specialist. It is also expected that the positive association between audit fees and analysts' forecast dispersion will be stronger in the presence of non-industry auditor specialists. That is, the extent of lower inherent risk (and information asymmetry) perceived from less dispersion in analysts' forecasts, and the subsequent impact that this has on audit fees, will be more pronounced when the audit firm is not an industry specialist.

To test the effect that auditors' industry specialization has, the sample is divided into firms that are audited by industry specialists and those that are not. In this study, audit firms are designated as being an industry specialist if the firm has the largest share of the industry's total sales revenue based on two-digit SIC industry

groups, which is in line with Gramling and Stone (2001). The fourth set of hypotheses are formally stated as follows:

H4a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for firms audited by non-specialist audit firms, ceteris paribus.*

H4b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for firms audited by non-specialist audit firms, ceteris paribus.*

2.12 Summary

The purpose of this chapter was to review the relevant research in information asymmetry, audit fees, and to present the empirical model for testing the hypotheses. The next chapter will describe the sample selection and the models used to test the hypotheses. The eight hypotheses developed in this chapter are listed below for ease of reference:

H1a: *There is a negative association between audit fees and analysts' earnings forecast accuracy, ceteris paribus.*

H1b: *There is a positive association between audit fees and analysts' earnings forecast dispersion, ceteris paribus.*

H2a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for smaller firms, ceteris paribus.*

H2b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for smaller firms, ceteris paribus.*

H3a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for young firms, ceteris paribus.*

H3b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for young firms, ceteris paribus.*

H4a: *The negative association between audit fees and analysts' earnings forecast accuracy will be stronger for firms audited by non-specialist audit firms, ceteris paribus.*

H4b: *The positive association between audit fees and analysts' earnings forecast dispersion will be stronger for firms audited by non-specialist audit firms, ceteris paribus.*

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology used in testing the eight hypotheses developed in the previous chapter. First will be a discussion of the data sources used to collect the sample data used in testing the hypotheses. This is followed by a discussion on the research design and model specification.

3.2 Sample

The sample used for testing the hypotheses comprise U.S. publicly listed firms for the years 2000 to 2012, and is drawn from *AuditAnalytics, Compustat* and *Compustat Segments* databases. The analysts' earnings forecast data is obtained from the Institutional Broker Estimation Service (IBES) database. Audit fees are obtained from the Audit Fees File of Audit Analytics database. Firms in utilities industries (SIC codes 4900-4999), banking industries (SIC codes 6000-6199), finance and financial related industries (SIC codes 6200-6299 and 6700-6799), insurance industries (SIC codes 6300-6499), and real estate industries (SIC codes 6500-6699, respectively) are excluded in line with other studies given that these

firms need to comply with industry specific regulatory requirements that could potentially confound the results. Firms with missing data are excluded from the testing. Data are windsorized at 1 percent to control for extreme values. All of the t-tests reported in this study are White's corrected t-tests (White, 1980) to control for heteroscedasticity. Year and industry are controlled for (not reported in tables). US publicly listed companies from the Audit Analytics database for which audit fee data for the 2000-2012 period are identified, totalling 163,333 firm-year observations. The following firms are excluded: (1) firms without analysts' earnings forecast data on the Institutional Broker Estimation Service (IBES) database; (2) firms with data unavailable on Compustat and Compustat Segment databases; (3) firms with missing data necessary to compute the control variables; and (4) firms in the utilities, banking, financial, insurance and real estate industries. These exclusions leave a total of 14,789 firm-year observations.

3.3 Research design and audit fee model

The Audit Fee Model was initially developed by Simunic (1980) and been applied empirically subsequently (see for example Palmrose 1986, Craswell and

Francis 1999; Whisenant et al. 2003; among others). The dependent variables, and the experimental variables used in this study will now be discussed.

3.4 Dependent variable

Following prior audit pricing studies the natural logarithm of total audit fees (obtained from the Audit Fees File of Audit Analytics database) as the dependent variable. The audit fees charged are disclosed by the entity in the financial statements in the 'Notes to and Forming Part of the Financial Statements' section in the annual reports.

3.5 Control variables

Based on previous research (including Simunic, 1980; Gul and Tsui, 1998; Tsui et al., 2001; Ferguson et al. 2003; Gul, 2006, among others), the following variables are controlled for in line with prior literature that has found these various variables to be associated with audit fees: the natural logarithm of total assets (*LNAT*); the natural logarithm of the number of business segments (*LNSEG*); inventories and receivables to total assets (*INVREC*); current assets minus inventories divided by total assets (*QUICK*); total liabilities divided by total assets

(*LEVERAGE*); return on assets (*ROA*); growth in sales (*SALESGRWTH*); foreign translation, which is a dummy variable, '1' if foreign translation occurs, and '0' otherwise (*FOREIGN*); if the firm was involved in merger activity in the previous year, a dummy variable '1', and '0' otherwise (*MERGER*); a year-end control being a dummy variable of '1' if year-end is not 31st December, and '0' otherwise (*YE*); if the firm has reported a net loss in the current financial reporting year, a dummy variable of '1', and '0' otherwise (*LOSS*); if a non-standard (modified) opinion was given in the current financial reporting period, a dummy variable of '1', and '0' otherwise (*OPINION*); if the firm is audited by a Big audit firm, a dummy variable of '1', and '0' otherwise (*BIGN*); and to measure early tenure of the audit firm and client relationship, a dummy variable of '1' if tenure is under two years, and '0' otherwise (*INITIAL*). These control variables will now be discussed in detail as to why they are included and their association with audit fees.

Client size (*LNAT*) is measured for using the logarithm of total assets and is identified as a significant determinant of audit fees by Simunic (1980). The procedures adopted by audit firms are primarily based on sampling and, as such, a larger size client will require larger sample sizes to be taken. The demand for audit firm effort is expected to increase with larger sized clients due to more resources

being expended when performing the audit. As such, there is an expectation of there being a positive association between client size, in terms of total assets, and audit fees. Hay et al. (2006) find size to be the most dominant determinant of audit fees. The variable *(QUICK),* measured as current assets minus inventories divided by total assets, is included to capture the impact that a firm's liquidity has an audit fees. Inventory and receivables require specific audit procedures and a deal of effort on the part of the audit firm because these are viewed as being relatively high-risk assets. Inventory requires checks of the physical presence, ownership and any impairment, as well as consideration of the value attributed to these assets by management. The receivables that result from sales are also required to be confirmed by the auditors with the checking of a sample of trade debtors. Both these tasks demand audit effort and therefore, higher audit fees are expected in firms with larger inventories and receivables. As such, the variable *INVREC* is included in the model.

Prior studies find that clients with a higher return on assets *(ROA)* are associated with lower audit fees. This is consistent with auditor pricing the assessments of client risk. More profitable clients pose less risk to the auditor in that they are more likely to remain a going concern, and are possibly less likely to

manage earnings. This results in lower audit fees being charged for firms with higher return on assets. Also included is a sales growth variable to control for firms' growth opportunities *(SALESGRWTH).* This control is included and is in line with Stice (1991) who argues that the effectiveness of the client's internal control system could be altered as the sales levels increase and this will affect the perceived audit risk. This author also argues that the auditor may increase or decrease the deployment of resources in order to reduce detection risk, and this additional effort afforded could potentially reduce the probability of *SALESGRWTH* being significant. A client's financial distress will increase the perceived risk by the audit firm and therefore such an occurrence will be associated with higher audit fees being charged. The variables *(LOSS)* and *(OPINION)* are both included to control for this. A positive association is expected between audit fees and firms that have been issued with a modified opinion *(OPINION)* given that prior studies document higher audit fees associated for these firms. This is possibly due to more investigative efforts being expended by the audit firm in such circumstances. Greater agency costs and a higher likelihood of a firm facing bankruptcy are associated with higher levels of debt. The variable *LEVERAGE* is included to control for this. The potential for an auditor to get things wrong and to be more likely to be exposed to litigation risk is expected to be higher when auditing more complex firms (Simunic, 1980). This risk

is generally associated with the degree of decentralization and diversification of the client firm. This is controlled for by including the variable that captures the number of business segments (*LNSEG*). Additionally, the indicator variable *FOREIGN* is used to capture whether or not a company has foreign operations. This is in line with previous studies (Hoitash, Hoitash and Bedard, 2007; Raghunandan and Rama, 2006). Although Simunic (1980) provided evidence that large audit firms may price at a discount due to economies of scale, subsequent studies (DeAngelo 1981b, Palmrose 1986, Simon and Francis 1988) have found that auditees are willing to pay a premium to large audit firms to audit their financial statements. This is due to the high quality audit that is perceived to be provided by the large audit firms. To capture the effect of differences that may exist in audit quality between auditors, *BIGN* (a dummy variable having a value of 1 if firm is audited by all of the Big audit firms i.e. PricewaterhouseCoopers, Ernst & Young, Deloitte Touché Tohmatsu, KPMG and Arthur Anderson) is included. Clients with the financial statement year end of 31st December *(YE)* are expected to have higher audit fees charged as these are audited in the predominantly busy season for the audit firms. Another variable that has been tested in previous studies is audit tenure. Ghosh and Moon (2005); Myers et al.(2003), and Carey and Simnett (2006), suggest that long serving auditors have greater client-specific knowledge and, as such, these auditors may need to

expend less effort to provide the same level of assurance compared to auditors with shorter tenures and less client-specific knowledge. To control for the lower audit fees being charged that is associated with the practice of 'low balling' in initial engagements, the control variable *INITIAL* (a dummy variable having a value of '1' and '0' otherwise if the auditor tenure is less than 2 years) is included. This inclusion is in line with Whisenant et al. (2003) and Hogan and Wilkin (2008). Control variables for client industry effects and year effects are included (although not reported) to control for differences in industries and years that could impact on audit fees.

The variables previously described are control variables which are firm and auditor-specific. Additionally two experimental variables that proxies for inherent risk are utilised to test the hypotheses.

The models used for testing the hypotheses are:

Model 2:

$$LAF = \beta_0 + \beta_1 LAGACCY + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} BIGN + \beta_{15} INITIAL + \sum year + \sum industry + \varepsilon_1 \quad (2)$$

Model 3:

$$LAF = \beta_0 + \beta_1 LAGDSP + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} BIGN + \beta_{15} INITIAL + \sum year + \sum industry + \varepsilon_1 \quad (3)$$

The first experimental variable is analysts' forecast accuracy (*LAGACCY*) which is analysts' forecast accuracy in the previous fiscal year (year t-1). Analysts' forecast accuracy is measured by the negative of the absolute value of forecast error scaled by stock price at time t-1 in line with the studies by Lang and Lundholm (1996) and Behn et al. (2008).

Model 4:

$$ACCY_t = (-1)(\left| FORECAST_t - EPS_t \right| \div PRICE_{t-1}) \quad (4)$$

LAGACCY is the lag of forecast accuracy, which is the analysts' earnings forecast accuracy in the previous fiscal year (year t-1). If audit firms use analyst forecast accuracy in their assessment of inherent risk, then this reliance should be represented in the analysts' forecast of the previous year as the assessment of inherent risk is done at the planning stage of when the current fiscal year earnings are being audited. Analysts' earnings forecast accuracy is measured by the negative of the absolute value of forecast error scaled by stock price at time t-1.

As an additional test, the first experimental variable *LAGACCY* variable is substituted with the experimental variable that is analysts' forecast dispersion (*LAGDSP*). This variable is the dispersion of analysts' forecast dispersion in the previous fiscal year (year t-1). Dispersion of analysts' forecast is defined as the standard deviation of earnings forecast issued by individual analysts. The equation for this variable follows:

Model 5:

$$DSP_t = (STD(FORECAST_t) \div PRICE_{t-1})$$

(5)

The analyst's earnings forecast dispersion utilized utilized is from the previous year because it is argue that if auditors use the information provided by analyst in their assessment of inherent risk, then it should be the analysts' forecast dispersion from the previous year as the current fiscal year earnings are under audit and would not be finalized.

In this thesis, analyst forecast accuracy and forecast dispersion are utilized as proxies for inherent risk which is in line with the previously discussed literature on information asymmetry. As far as these measures capture the extent of inherent risk, it is posited that the audit firms will perceive lower inherent risk when analysts' earnings forecasts are more accurate. This in turn, is likely to impact the auditors' decision of whether or not to increase the deployment of greater resources to reduce the level of detection risk so as to achieve an acceptable level of overall audit risk, which will subsequently impact on the audit fees. Similarly, greater analysts' forecast dispersion will be perceived by the audit firm as being associated with higher inherent risk, given the existence of a higher extent of information asymmetry. This is likely to impact on the auditors' decision to increase the deployment of greater resources to reduce detection risk so as to achieve an acceptable level of overall audit risk. The

deployment of this increased effort in achieving this will be reflected in higher audit fees.

3.6 Summary

The purpose of this chapter was to discuss the research methodology used to investigate the eight hypotheses as developed in the previous chapter, to describe the data sources used in collecting the data sample, and to describe the variables used in testing the hypotheses. The next chapter will present the empirical results.

CHAPTER 4

EMPIRICAL RESULTS

4.1 Introduction

This chapter reports the results from the empirical testing of the hypotheses developed in Chapter 2. The first section provides an overview of sample characteristics. The following three sections present the main results of this thesis with respect hypothesis testing, and the results from additional robustness tests performed.

4.2 Descriptive statistics

The descriptive statistics for both the dependent and independent variables are provided in Table 1. Analysts' forecast accuracy in year t-1 (*LAGACCY*) has a mean of -0.045 and analysts' forecast dispersion in t-1 (*LAGDSP*) has a mean of 0.134. The Audit fee has a mean of US$1.901M. Big 5 auditors audited just over 88 percent of the sample firms. The mean total assets is US$4.002B. Firms reporting a net loss were 29 percent of the sample firms, and 1.6 percent of firms were involved in merger activity. *INVREC* (inventories and receivables to total assets ratio) has mean of 0.24 and *QUICK* (current assets minus inventories divided by total assets) has a mean of 2.683. *LEVERAGE* (total liabilities divided by total assets) has a mean of 0.145. The average growth in sales (*SALESGRWTH*) in the full sample was 24 percent while the

average return on assets (ROA) of the sample firms was 5.6 percent. The percentage of firms having financial year end of 31st December were 70.3 percent, while 39.2 percent received nonstandard (modified) audit reports.

4.3 Correlations

Table 2 reports on the Pearson Correlation Matrix which is the bivariate statistical correlations between all the variables used in the regression testing. The results show that the dependent variable (*LAF*), being the logarithm of audit fees, is significant (p<0.01) and positively correlated with LNAT, *LNSEG, LEVERAGE, ROA, FOREIGN, MERGER, OPINION, and BIGN,* and is significant (p<0.01) and negatively correlated with *INVREC, QUICK, LOSS,* and *INITIAL.*

Concerning the two experimental variables, *LAGDSP* is significant (p<0.01) and negatively correlated with *LAGACCY*. The direction of this correlation is as expected given that greater analysts' forecast accuracy would lead to lower levels of analysts' forecast dispersion. *LAF* is positive and significantly (p<0.01) correlated with *LAGACCY*, and is negative and significantly (p<0.01) correlated with *LAGDSP*.

4.4 Multivariate results

4.4.1 Analysts' forecast accuracy and dispersion

Table 3 reports the multiple regression results from testing the association between the logarithm of audit fees *(LAF)* and the two experimental variables (1) forecast accuracy (*LAGACCY*), which is analysts' forecast accuracy in the previous fiscal year (year t-1), and (2) analysts' forecast dispersion (*LAGDSP*), which is the dispersion of analysts' forecast dispersion in the previous fiscal year (year t-1). The coefficient for *LAGACCY* is negative and significantly (*-0.013, p<0.1*) associated with audit fees. This result supports (H1a) that more accurate analysts' earnings forecasts are associated with lower inherent risk, and associated with lower risk. As such, these are associated with lower audit fees. The coefficient of *LAGDSP* is positive and significantly (*0.021, p<0.01*) associated with audit fees. This result supports the second hypothesis (H1b) that greater analysts' earnings forecast dispersion is associated with a higher extent of inherent risk, and as such they are associated with higher audit fees. The coefficients of *LNAT* (natural logarithm of assets) for Models 2 and 3 are positive and significant (0.508, $p<0.01$, for Model 2; 0.509, $p<0.01$, for Model 3) associated with audit fees. This is consistent with findings from other studies as per the previous discussion in Chapter 2. The auditing procedures adopted by audit firms are primarily based on sampling and, as such, a

larger size client will require larger sample sizes being taken. The demand for audit firm effort is expected to increase with larger sized clients due to more resources being required when performing the audit. This results in an expected positive association between size and audit fees. The coefficients of *LNSEG* (natural logarithm of number of business segments) are positive and significantly (0.117, $p<0.01$, for Model 2; 0.118, $p<0.01$, for Model 3) associated with audit fees. The coefficients of *INVREC* (inventory and receivables to assets ratio) are positive and significantly (0.453, $p<0.01$, for Model 2; 0.455, $p<0.01$, for Model 3) associated with audit fees. The coefficients of *MERGER* (a dummy variable of '1' if the firm was involved in merger activity in the previous year, and '0' otherwise) are positive and significantly (0.060, $p<0.1$, for Model 2; 0.060, $p<0.1$, for Model 3) associated with audit fees. These three variables (*LNSEG*, *INREC* and *MERGER*) are in expected direction and have been shown in prior studies to be positive and significantly associated with audit fees. The more complex the firm structure, the more demanding it is to conduct an audit, therefore higher audit fees are expected to be associated with more complex firms. The coefficients of *QUICK* (current assets minus inventories, divided by current liabilities) are negative and significantly (-0.021, $p<0.01$, for Model 2; -0.020, $p<0.01$, for Model 3) associated with audit fees. This variable measures the level of client liquidity and is expected to be negatively associated with audit fees. A lower

quick ratio indicates that the firm is riskier because the firm is at a greater risk of being unable to repay its current liabilities in the next accounting period and such firms therefore are expected to be associated with higher audit fees. The coefficients of *LEVERGE* (total liabilities divided by total assets) are negative and significantly (-0.075, $p<0.05$, for Model 2; -0.073, $p<0.05$, for Model 3) associated with audit fees. This is in line with studies of Gul and Tsui (1998) and Gul and Goodwin (2010) based on agency arguments that firms with relatively more leverage are likely to be associated with lower risk of material misstatement. Which implies lower audit risk and, as such auditors charge lower fees as they are likely to expend less audit effort for such firms. The coefficients of *ROA* (return on assets) are negative and significantly (-0.011, $p<0.05$, for Model 2; -0.011, $p<0.05$, for Model 3) associated with audit fees. This is in line with prior studies that find clients with higher *(ROA)* are associated with lower audit fees. More profitable clients pose less risk to the auditor in that they are more likely to remain a going concern and possibly less likely to manage earnings. This results in lower audit fees being charged. The coefficients of *YE* (a year-end control being a dummy variable of '1' if year-end is not 31st December, and '0' otherwise) are negative and significantly (-0.117, $p<0.01$, for Model 2; -0.117, $p<0.01$, for Model 3) associated with audit fees. Clients with the financial statement year end of 31st December are expected to have higher audit fees charged as these are

the predominant busy season for the audit firms. The coefficients of *LOSS* (a dummy variable of '1' if the firm has reported a net loss in the current financial reporting year, and '0' otherwise) are positive and significantly (0.173, $p<0.01$, for Model 2; 0.173, $p<0.01$, for Model 3) associated with audit fees. A client's financial distress will increase the perceived risk by the audit firm and therefore will increase the audit fees charged. The coefficients of *OPINION* (a dummy variable of '1' if a non-standard [modified] opinion was given in the current financial reporting period, and '0' otherwise) are positive and significantly (0.134, $p<0.01$, for Model 2; 0.134, $p<0.01$, for Model 3) associated with audit fees. A positive association is expected between audit fees and firms that have had modified opinion. This is possibly due to more investigative efforts being required by the audit firm in such circumstances. The coefficients of *BIGN* (a dummy variable having a value of 1 if firm is audited by all of the Big audit firms i.e. PricewaterhouseCoopers, Ernst & Young, Deloitte Touché Tohmatsu, KPMG and Arthur Anderson, and '0' otherwise) are positive and significantly (0.199, $p<0.01$, for Model 2; 0.198, $p<0.01$, for Model 3) associated with audit fees. These support the studies DeAngelo (1981b), Palmrose (1986), Simon and Francis (1988) that found that auditees are willing to pay higher premium for large audit firms to audit their financial statements due to the high quality service that it is perceived these large audit firms provide. The coefficients of *INITIAL* (a dummy

variable of '1' if the auditor tenure is under two years, and '0' otherwise) are negative and significantly (-0.269, p<0.01, for Model 2; -0.269, p<0.01, for Model 3) associated with audit fees. The results support Palmrose (1987) litigation risk argument. Although the auditor may have the auditing expertise, they may lack the specific knowledge about the new client in the initial years of audit engagement. As such, this will increase the litigation risk in the early years of audit engagements. The adjusted R^2 of these regression tests are 74.61 percent and 74.62 percent for Models 2 and 3 respectively. This provides confidence in the explanatory power of the Audit fee Model being tested.

4.4.2 Analysts' forecast accuracy and dispersion and firm size

Table 4 reports the multiple regression results from testing the association between the logarithm of audit fees and the experimental variable *LAGACCY* as to whether firm size affects this association. The sample firms are split at the median of total assets into small firms (N=7,395) and large firms (N=7,394). The coefficient of *LAGACCY* is negative and significant (*-0.017, p<0.01*) only for the small firm sample. The coefficient of *LAGACCY* of the large firm sample whilst positive is not significant. This result supports our third hypothesis (H2a) that the negative

association between audit fees and analysts' earnings forecast accuracy will be stronger for small firms compared to large firms. This is because the higher information asymmetry environment of smaller firms, the auditors are more likely to use analyst forecast accuracy in their assessment of inherent risk. Most of the control variables are found to be significant and in the predicted direction. The coefficients of *LNAT, INVREC, LOSS, OPINION* and *BIGN* are found to be positively associated with audit fees, while *QUICK* and *INITIAL* are negatively associated with audit fees for both the small firm and large firm samples. The coefficient of *SALESGRWTH* is positive and significantly associated with audit fees for the small firm sample only. The adjusted R^2 of these regression tests are 53.6 percent and 70.83 percent for the small and large firm respectively.

Table 5 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGDSP* and whether firm size affects this association. The sample firms are split at the median of total assets into small firms (*N*=7,395) and large firms (*N*=7,394). The coefficient of *LAGDSP* is positive and significant (0.021, $p<0.01$) only for the small firm sample. The coefficient of *LAGDSP* of the large firm sample whilst negative is not significant. This result supports hypothesis (H2b) that the positive association between audit fees

and analysts' earnings forecast dispersion will be stronger for smaller sized firms. We suggest that this is because auditors are more likely to use analyst forecast dispersion in their assessment of inherent risk for smaller firms, and that more accurate analysts' earnings forecast dispersion for smaller firms will have a greater impact on the risk perceptions of audit firms given the higher perceived risk and higher information asymmetry that is inherent in these firm types. All the control variables are in the expected direction. The coefficients of *LNAT, INVREC, LOSS, OPINION,* and *BIGN* are positive and significantly associated with audit fees for both the small and large firm samples, while the coefficient of *LNSEG, LEVERAGE, FOREIGN* and *MERGER* are positive and significantly associated with audit fees for the large firm sample only. The coefficient *QUICK, YE* and *INITIAL* are negative and significantly associated with audit fees, while the coefficient *SALESGRWTH* is positive and significantly associated with audit fees for the small firm sample only. The adjusted R^2 of these regression tests are 53.61 percent and 70.83 percent for the small and large firm sample respectively.

4.4.3 Analysts' forecast accuracy and dispersion and firm age

Table 6 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGACCY* and whether firm age affects this association. The sample firms are split into quartiles based on the number of years since the firm's inclusion on the CRSP database. The youngest firms (*N*=3,388) are those in the lower quartile, and older firms (*N*=3,796) are those in the highest quartile. The coefficient of *LAGACCY* is negative and significant (*-0.018, p<0.05*) only for the young firm sample. The coefficient of *LAGACCY* of the old firm sample whilst negative is not significant. This result supports hypothesis (H3a) that a negative association between audit fees and analysts' earnings forecast accuracy will be stronger for younger firms. This is because with a higher information asymmetry environment for younger firms, the auditors are more likely to use analyst forecast accuracy in their assessment of inherent risk, and more accurate analysts' earnings forecast accuracy for younger firms will have a greater impact on the risk perceptions of audit firms given the higher risk and higher information asymmetry that is inherent in these firm types leading to lower audit fees. The coefficients of *LNAT* and *OPINION* are positive and significantly associated with audit fees for both the young and old firm samples, while the coefficient of *LNSEG* and *INVREC* are positive and significantly associated with audit fees for the old firm

sample only. The coefficients of *MERGER* and *BIGN* are positive and significantly associated with audit fees for the young firm sample only, while the coefficients of *LOSS* is positive and significantly associated with audit fees for the old firm sample only. The coefficient of *YE* and *INITIAL* are negative and significantly associated with audit fees for both the young and old firm samples, while the coefficient of *QUICK* is negative and significantly associated with audit fees for the young firm sample only. The coefficient on *ROA* is negative and significantly associated with audit fees for the old firm sample only. The coefficient of *SALESGRWTH* is positive and significantly associated with audit fees for the young firm sample only. The adjusted R^2 of these regression tests are 57.92 percent and 80.06 percent for the young and old firm sample respectively.

Table 7 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGDSP* and whether firm age affects this association. The sample firms are split into quartiles based on the number of years since the firm's inclusion on the CRSP database. The youngest firms (*N*=3,388) are those in the lower quartile, and older firms (*N*=3,796) are those in the highest quartile. The coefficient of *LAGDSP* is positive and significant (0.043, $p<0.05$) only for the young firm sample. The coefficient of

LAGDSP of the old firm sample whilst positive is not significant. This result supports hypothesis (H3b) that a positive association between audit fees and analysts' earnings forecast dispersion will be stronger for younger firms. This is because higher information asymmetry environment of younger firms, the auditors are more likely to use analyst forecast dispersion in their assessment of inherent risk, and more accurate analysts' earnings forecast dispersion for younger firms will have a greater impact on the risk perceptions of audit firms given the higher risk and higher information asymmetry that is inherent in these firm types. The coefficients of *LNAT* and *OPINION* are positive and significantly associated with audit fees for both the young and old firm samples, while the coefficient of *LNSEG* and *INVREC* are positive and significantly associated with audit fees for the old firm sample only. The coefficients of *MERGER* and *BIGN* are positive and significantly associated with audit fees for the young firm sample only, while the coefficients of *LOSS* is positive and significantly associated with audit fees for the old firm sample only. The coefficient of *YE* and *INITIAL* are negative and significantly associated with audit fees for both the young and old firm samples, while the coefficient of *QUICK* is negative and significantly associated with audit fees for the young firm sample only. The coefficient of *ROA* is negative and significantly associated with audit fees for the old firm sample only. The coefficient of *SALESGRWTH* is positive and significantly associated with audit fees

for the young firm sample only. The adjusted R^2 of these regression tests are 57.95 percent and 80.05 percent for the young and old firm sample respectively.

4.4.4 Analysts' forecast accuracy and auditor industry specialization

Table 8 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGACCY* and whether auditor industry specialization affects this association. The sample consists of firms audited by Big audit firms only (*N*=12,905) and firms are split into firms that are audited by industry specialists (*N*=3,945), and those firms audited by non-specialist audit firms (*N*=8,960). Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings. The coefficient of *LAGACCY* is negative and significant (*-0.027, p<0.01*) only for the firms audited by non-specialist audit firms. The coefficient of *LAGACCY* of the firms audited by specialist audit firms whilst negative is not significant. This result supports hypothesis (H4a) that the negative association between audit fees and analysts' earnings forecast accuracy will be stronger when firms are audited by non-specialist auditors. This is because industry non-specialist auditors with less superior knowledge about the industry upon which

their focus will be, compared to industry specialist auditors, are more likely to use the analyst earning forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist auditors will have a greater impact on the risk perceptions of auditors given the higher risk and higher information asymmetry that is inherent in these firm types. The coefficients of *LNAT, LNSEG, INVREC, LOSS* and *OPINION* are positive and significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient of *MERGER* is positive and significantly associated with audit fees for the non-specialist auditor sample only, while the coefficient of *FOREIGN* is positive and significantly associated with audit fees for the specialist auditor sample only. The coefficients of *QUICK, YE* and *INITIAL* are negative and significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient on *ROA* is negative and significantly associated with audit fees for the non-specialist auditor sample only, while the coefficient on *SALESGRWTH* is negative and significantly associated with audit fees for the specialist auditor sample only. The adjusted R^2 of these regression tests are 72.49 percent and 81.02 percent for the non-specialist and the specialist auditor samples respectively.

Table 9 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGDSP* and whether auditor industry specialization affects this association. The sample consists of firms audited by Big audit firms only (*N*=12,905) and firms are split into firms that are audited by industry specialists (*N*=3,945), and those firms audited by non-specialist audit firms (*N*=8,960). Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings. The coefficient of *LAGDSP* is positive and significant (0.018, $p<0.05$) only for the firms audited by non-specialist audit firms. The coefficient of *LAGDSP* of the firms audited by specialist audit firms whilst positive is not significant. This result supports hypothesis (H4b) that a positive association between audit fees and analysts' earnings forecast dispersion will be stronger when firms are audited by non-specialist audit firms. This is because industry non-specialist audit firms with less superior knowledge about the industry upon which their focus will be, compared to industry specialist audit firms, are more likely to use the analyst earning forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist audit firms will have a greater impact on the risk perceptions of audit firms given the higher risk and higher information asymmetry that is inherent in these firm types.

The coefficients of *LNAT, LNSEG, INVREC, LOSS* and *OPINION* are positive and significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient of *MERGER* is positive and significantly associated with audit fees for the non-specialist auditor sample only. The coefficients of *QUICK, YE* and *INITIAL* are negative and significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient of *FOREIGN* is positive and significantly associated with audit fees for the specialist auditor sample only, while the coefficient of *MERGER* is positive and significantly associated with audit fees for the non-specialist auditor sample only. The coefficient of ROA is negative and significantly associated with audit fees for the non-specialist auditor sample only, while the coefficient of *SALESGRWTH* is negative and significantly associated with audit fees for the specialist auditor sample only. The adjusted R^2 of these regression tests are 72.47 percent and 81.02 percent for the non-specialist and the specialist auditor samples respectively.

4.5 Robustness tests

Additional sensitivity analyses were performed to confirm the robustness of reported findings. These include splitting the sample firms at the median of sales

revenue instead of at the median of total assets. Second, the test for auditor industry specialization is repeated by splitting the sample into firms that are audited by industry specialists if the firm has the largest share of the industry's total assets based on two-digit SIC industry groups [in line with Gramling and Stone (2001)]. Previous reported testing used total sales revenue to determine which audit firms have the largest share in the industry. The results obtained from these additional tests are substantially the same as was previously reported in this study.

4.5.1 Analysts' earnings forecast on firm size effects using sales revenue

Table 10 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGACCY* as to whether firm size affects this association. The sample firms are split at the median of total sales revenue into small firms (*N*=7,394) and large firms (*N*=7,395). The coefficient of *LAGACCY* is negative and significant (*-0.017, p<0.01*) only for the small firm sample. The coefficient of *LAGACCY* of the large firm sample whilst positive is not significant. This result supports and confirms hypothesis (H2a) that the negative association between audit fees and analysts' earnings forecast accuracy will be stronger for small firms compared to large firms. This is because the higher

information asymmetry environment of smaller firms, the auditors are more likely to use analyst forecast accuracy in their assessment of inherent risk. Most of the control variables are found to be significant and in the predicted direction. The coefficients of *LNAT, LEVERGE, LOSS, OPINION* and *BIGN* are found to be positively associated with audit fees, while the coefficients of *LNSEG, INVREC* and *MERGER* are positive and significantly associated with audit fees for the large firm sample only. The coefficients of *QUICK, YE* and *INITIAL* are negatively associated with audit fees for both the small and large firm samples, while the coefficient of *ROA* is negative and significantly associated with audit fees for the large firm sample only. The adjusted R^2 of these regression tests are 54.96 percent and 71.68 percent for the small and large firm samples respectively.

Table 11 reports the multiple regression results from testing the association between the logarithm of audit fees and the experimental variable *LAGDSP* and whether firm size affects this association. The sample firms are split at the median of total sales revenue into small firms (*N*=7,394) and large firms (*N*=7,395). The coefficient of *LAGDSP* is positive and significant (0.017, $p<0.01$) only for the small firm sample. The coefficient of *LAGDSP* of the large firm sample whilst negative is not significant. This result supports and confirms hypothesis (H2b) that the positive

association between audit fees and analysts' earnings forecast dispersion will be stronger for smaller sized firms. This is argued to be due to auditors are more likely to use analyst forecast dispersion in their assessment of inherent risk for smaller firms, and that more accurate analysts' earnings forecast dispersion for smaller firms will have a greater impact on the risk perceptions of auditors given the higher perceived risk and higher information asymmetry that is inherent in these firm types. All the control variables are in the expected direction. The coefficients of *LNAT, LEVERGE, LOSS, OPINION* and *BIGN* are found to be positively associated with audit fees, while the coefficients of *LNSEG, INVREC* and *MERGER* are positive and significantly associated with audit fees for large firm sample only. The coefficients of *QUICK, YE* and *INITIAL* are negatively associated with audit fees for both the small and large firm samples, while the coefficient of *ROA* is negative and significantly associated with audit fees for the large firms sample only. The adjusted R^2 of these regression tests are 54.96 percent and 71.68 percent for the small and large firm samples respectively.

4.5.2 Analyst's earnings forecast accuracy on auditor industry specialization effects using industry's total assets

Table 12 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGACCY* and whether auditor industry specialization affects this association. The sample consists of firms audited by Big auditors only (*N*=12,905) and firms are split into firms that are audited by industry specialists (*N*=4,024), and those firms audited by non-specialist auditors (*N*=8,881). Firms are classified as being audited by a specialist auditor if the auditor has the largest share of the industry's total assets based on two-digit SIC industry groupings. The coefficient of *LAGACCY* is negative and significant (*-0.028, p<0.01*) only for the firms audited by non-specialist auditors. The coefficient of *LAGACCY* of the firms audited by specialist auditors whilst negative is not significant. This result supports and confirms hypothesis (H4a), that the negative association between audit fees and analysts' earnings forecast accuracy will be stronger when firms are audited by non-specialist auditors. This is because industry non-specialist auditors are more likely to use the analyst earning forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist auditors will have a greater impact on the risk perceptions of auditors given the higher risk and higher information asymmetry that is inherent in these firm types. The coefficients of *LNAT, LNSEG, INVREC, LOSS* and *OPINION*

are positive and significantly associated with audit fees for both the non-specialist auditors and the specialist auditors samples. The coefficient on *MERGER* is positive and significantly associated with audit fees for the non-specialist auditors sample only, while the coefficient on *FOREIGN* is positive and significantly associated with audit fees for the specialist auditors sample only. The coefficients of *QUICK*, *YE* and *INITIAL* are negative and significantly associated with audit fees for both the non-specialist auditor and the specialist auditor samples. The coefficient of *ROA* is negative and significantly associated with audit fees for the non-specialist auditor sample only, while the coefficient of *SALESGRWTH* is negative and significantly associated with audit fees for the specialist auditor sample only. The adjusted R^2 of these regression tests are 72.68 percent and 80.28 percent for the non-specialist and the specialist auditor samples respectively.

Table 13 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGDSP* and whether auditor industry specialization affects this association. The sample consists of firms audited by Big audit firms only (*N*=12,905) and firms are split into firms that are audited by industry specialists (*N*=4,024), and those firms audited by non-specialist audit firms (*N*=8,881). Firms are classified as being audited by a specialist

audit firm if the audit firm has the largest share of the industry's total assets based on two-digit SIC industry groupings. The coefficient of *LAGDSP* is positive and significant (0.018, $p<0.05$) only for the firms audited by non-specialist audit firms. The coefficient of *LAGDSP* of the firms audited by specialist audit firms whilst positive is not significant. This result supports and confirms hypothesis (H4b), that the positive association between audit fees and analysts' earnings forecast dispersion will be stronger when firms are audited by non-specialists auditors. This is because industry non-specialist audit firms with less superior knowledge about the industry upon which their focus will be, compared to industry specialist audit firms, are more likely to use the analyst earning forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist audit firms will have a greater impact on the risk perceptions of audit firms given the higher risk and higher information asymmetry that is inherent in these firm types. The coefficients of *LNAT, LNSEG, INVREC, LOSS* and *OPINION* are positive and significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient of *MERGER* is positive and significantly associated with audit fees for the non-specialist auditor sample only, while the coefficient of *FOREIGN* is positive and significantly associated with audit fees for the specialist auditor sample only. The coefficients of *QUICK, YE* and *INITIAL* are negative and

significantly associated with audit fees for both the non-specialist and the specialist auditor samples. The coefficient of *ROA* is negative and significantly associated with audit fees for the non-specialist auditor sample only. The adjusted R^2 of these regression tests are 72.47 percent and 80.28 percent for the non-specialist and the specialist auditor samples respectively.

4.6 Self-selection bias

It is considered that the previously reported results from testing the hypotheses could potentially suffer from endogeneity problems. These endogeniety concerns result due to the fact that the sample firms used for testing consist of only those firms that have analysts' forecasts made, and this is at the exclusion of firms that do not. Specifically, analysts' coverage (i.e., analyst's decision to follow a firm) is an endogenous decision and the factors that influence the analysts' coverage can also influence the dependent variables (both *ACCY* and *DSP*). This presents a self-selection bias, with measures taken to investigate selection effects.

A two-stage least-squares regression approach is utilised so as to obtain more consistent and efficient estimators. In the first stage, predicted values for both

analysts' forecast accuracy ($ACCY_t$) and analysts' forecast dispersion (DSP_t) in the current fiscal year are obtained. Experimental variables of forecast accuracy (*LAGACCY*), which is analysts' forecast accuracy in the previous fiscal year (year t-1), and analysts' forecast dispersion (*LAGDSP*), which is the dispersion of analysts' forecast dispersion in the previous fiscal year (year t-1), result in the number of firm-year observations dropping from 11,786 to 11,245 for analysts' earnings forecast accuracy, and the number of firm-year observations dropping from 11,831 to 11,288 for analysts' earnings forecast dispersion in the second stage regression model.

In estimating predicted values for both analysts' forecast accuracy ($ACCY_t$) and analysts' forecast dispersion (DSP_t) in the current fiscal year, a model similar to Behn et al. (2008) is operationalised. It should be noted that the calculation of the predicted value for analysts' forecast accuracy (as described in Model 5) is similar to the calculation of the predicted value for analysts' forecast dispersion (as described in Model 6) except that control variables *NANA*, *LOSS* and *EPS* (the descriptions of which follow) are not included in the calculation of predicted value for analysts' forecast dispersion. Behn et al. (2008) argue that this exclusion is necessary due to a lack of conceptual linkage between these control variables and

analysts' forecast dispersion. Note that as a further sensitivity analysis, these previously excluded control variables are subsequently included in the first stage regression and the results (not reported) are quantitatively similar.

Model 6:

$$ACCY = \beta_0 + \beta_1 BIGN + \beta_2 LNAT + \beta_3 SURPRISE + \beta_4 LOSS + \beta_5 ZMIJ + \beta_6 HORIZON + \beta_7 STDROE + \beta_8 NANA + \beta_9 EPS + \beta_{10} AIS + \beta_{11} MILLS + \sum year + \sum industries + \varepsilon_1 \quad (6)$$

Model 7:

$$DSP = \beta_0 + \beta_1 BIGN + \beta_2 LNAT + \beta_3 SURPRISE + \beta_5 ZMIJ + \beta_6 HORIZON + \beta_7 STDROE + \beta_8 AIS + \beta_9 MILLS + \sum year + \sum industries + \varepsilon_1 \quad (7)$$

The above control variables are described as follows: *BIGN* is a dummy variable of '1', and '0' otherwise if the firm is audited by a Big audit firm; *LNAT* is the natural logarithm of total assets; *SURPRISE* is this year's earnings minus last year's earnings deflated by stock price; *LOSS* is a dummy variable of '1', and '0' otherwise if the firm has reported a net loss in the current financial reporting year;

ZMIJ is Zmijewski's (1984) financial distress prediction model[2]; *HORIZON* is logarithm of the average of the number of calendar days between the mean forecast announcement date and the subsequent actual earnings announcement date; *STDROE* is the standard deviation of earnings over the previous five years; *NANA* is logarithm of number of analysts following the client; *EPS* is the earnings per share; *AIS* is auditors' industry specialization and is measured based on its share of clients' total sales revenue in the two-digit SIC industry group, and an auditor is assumed to be a specialist in an industry if the auditor has the largest share of the industry's total sales revenue; *MILLS* represents the inverse Mills ratio for endogenous analyst choice. This is because analysts' coverage (i.e., analyst's decision to follow a firm) is an endogenous decision for each firm and the factors that influence the analysts' coverage can also influence the dependent variables (both *ACCY* and *DSP*). The inverse Mills ratio controls for this possible endogeneity concern and it is computed running the following probit regression (Model 8) which has been adapted from the model used by Bhushan (1989).

[2] For a description of coefficient estimates used for calculation purposes refer to Definition of Variables section (p.143). These estimates are reported in Lennox and Park (2007, p.251)

Model 8:

$$ACVR = \beta_0 + \beta_1 NINST + \beta_2 PCTGINST + \beta_3 STDRET + \beta_4 RSQR + \beta_5 NLOB + \beta_6 LNMV + \beta_6 PCTGINTERNAL + \sum year + \sum industries + \varepsilon_1 \quad (8)$$

The dependent and control variables are described as follows: *ACVR,* is a dummy variable of '1' if there is an analyst following the firm, and '0' otherwise; *NINST* is the number of institutions holding shares in the firm; *PCTGINST* is the percentage of shareholding by all institutions; *STDRET* is the standard deviation of yearly stock returns from 2000 – 2012; *RSQR* is the r-square between the daily market returns and the firm's returns from 2000-2012; *NLOB* is the number of lines of business of a firm based on four-digit SIC codes; *LNMV* is logarithm of market value of equity; and *PCTGINTERNAL* is the percentage of shares held by insiders.

Table 14 reports the results of the first stage regression to obtain the predicted value of analysts' earnings forecast accuracy ($ACCY_{t)}$) (obtained using Model 5). The coefficients of *LOSS*, *SURPRISE*, *ZMIJ* and *STDROE* are negatively and significantly ($p<0.01$) associated with the predicted value of $ACCY_t$. The coefficient of *MILLS* is positively and significantly associated with the predicted value of $ACCY_t$. The adjusted R-square is 12.25 percent. Table 14 also reports the

results of the second stage regression that incorporates the obtained predicted values for *LAGACCY* into the audit fees model.

The second stage results complement and provide confidence in the previously reported findings. The coefficient of *LAGACCY* is negative and significant (-0.*578, p<0.01*) supporting the first hypothesis (H1a) that more accurate analysts' earnings forecasts are associated with lower inherent risk, are perceived by audit firms as being associated with lower risk, and, as such, are associated with lower audit fees. The coefficients of *LNAT*, *LNSEG*, *INVREC*, *FOREIGN*, *MERGER*, *LOSS*, *OPINION* and *BIGN* are positively and significantly associated with audit fees. The coefficients of *QUICK*, *LEVERAGE*, *ROA*, *YE* and *INITIAL* are negatively and significantly associated with audit fees. The adjusted R-square is 72.86 percent.

Lennox, Francis and Wang (2012) emphasize that when using the Heckman (1979) procedure to control for selection bias, at least one variable needs to be identified that influences the dependent variable in the first-stage model but that does not influence the dependent variable of the second stage regression model. The

variable that has been identified for this that does not influence the dependent variable of the second stage regression model is *HORIZON*, which is the logarithm of the average of the number of calendar days between mean forecast announcement date and subsequent actual earnings announcement date. The argument for selecting the variable *HORIZON* is twofold: First, this variable, along with analysts' characteristics and past analysts' forecast accuracy is argued by Brown (2001) to be a good predictor of analysts' forecast accuracy. This is supported also by findings by both Gul, Hutchinson and Lai (2013) and Behn et al. (2008) who document that a shorter forecast horizon is associated with more accurate analysts' earnings forecast. The regression results from the first stage testing (using Model 6) support this with the coefficient of *HORIZON* being negative and significant (-0.043, $p<0.01$). Second, it is argued that for the second stage testing, *HORIZON* should not be expected to be associated with audit fees (*LAF*). The reason for this is because there is no expectation that *HORIZON*, which is the logarithm of the average number of calendar days between mean forecast announcement date and subsequent actual earnings announcement date, would have any influence over an auditors' assessment of the firm's inherent risk, and subsequent audit fees. The subsequent results from the second stage testing (using Model 9) are consistent with this, and support that

there is no significant association found between *HORIZON* and *LAF*. These results are reported in Table 15. The coefficient of *HORIZON* is positive and not significant.

Model 9:

$$LAF = \beta_0 + \beta_1 LAGACCY + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} AUDITOR + \beta_{15} INITIAL + \beta_{16} HORIZON + \sum year + \sum industry + \varepsilon_1 \quad (9)$$

Table 16 reports the results of the first stage regression to obtain the predicted value of analysts' earnings forecast dispersion (DSP_t) (obtained using Model 6). The coefficients of *SURPRISE*, *ZMIJ*, *STDROE* and *MILLS* are positively and significantly ($p<0.01$) associated with the predicted value of DSP_t, whilst the coefficient of *LNAT* is negatively and significantly ($p<0.01$) associated with the predicted value of DSP_t. The adjusted R-square is 14.06 percent. Table 16 also reports the results of the second stage regression that incorporates the obtained predicted values for *LAGDSP* into the audit fees model. The second stage results complement and give further confidence in the earlier reported findings. The coefficient of *LAGDSP* is positive and significant (0.572, $p<0.05$) supporting hypothesis (H1b), that greater analysts' forecast dispersion is associated with higher

inherent risk as perceived by the audit firms, and as such is associated with significantly higher audit fees. These results provide greater confidence in our previously reported results. The coefficients of *LNAT*, *LNSEG*, *INVREC*, *FOREIGN*, *MERGER*, *LOSS*, *OPINION* and *BIGN* are positively and significantly associated with audit fees. The coefficients of *QUICK*, *LEVERAGE*, *ROA*, *YE* and *INITIAL* are negatively and significantly associated with audit fees. The adjusted R-square is 72.82 percent. The coefficient of *HORIZON* in the first stage (using Model 6) is positive and significant (0.035, $p<0.01$).

As mentioned and argued above, *HORIZON* is identified as a variable that influences the dependent variable in the first-stage model but does not influence the dependent variable of the second stage regression model. Table 17 reports the coefficient of *HORIZON* when it is included in the second stage testing (using Model 10) regression model and it is positive and, as expected, not significantly associated with audit fees.

Model 10:

$$LAF = \beta_0 + \beta_1 LAGDSP + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} AUDITOR + \beta_{15} INITIAL + \beta_{16} HORIZON + \sum year + \sum industry + \varepsilon_1 \quad (10)$$

4.7 Additional testing suggested by examiner

Table 18 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGACCY* and incorporating variable AGE as suggested by one of the examiners. The sample consists of firms audited by Big auditors only (*N*=12,905) and firms are split into firms that are audited by specialists auditors (*N*=3,945), and those firms audited by non-specialist auditors (*N*=8,960). Firms are classified as being audited by a specialist auditor if the auditor has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings. The coefficient of *LAGACCY* is negative and significant (*-0.027, p<0.01*) only for the firms audited by non-specialist auditors. The coefficient of *LAGACCY* of the firms audited by specialist auditors whilst negative is not significant. This result supports hypothesis (H4a) that the negative association between audit fees and analysts' earnings forecast accuracy will be stronger when firms are audited by non-specialist auditors. This is because industry non-specialist

auditors with less superior knowledge about the industry upon which their focus will be, compared to industry specialist auditors, are more likely to use the analysts' earnings forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist auditors will have a greater impact on the risk perceptions of auditors given the higher risk and higher information asymmetry that is inherent in these firm types. The coefficients of *LNAT*, *LNSEG*, *INVREC*, *LOSS* and *OPINION* are positive and significantly ($p<0.01$) associated with audit fees for both the non-specialist auditors and the specialist auditors samples. The coefficient of *MERGER* is positive and significantly ($p<0.05$) associated with audit fees for the non-specialist auditors sample only, while the coefficient of *FOREIGN* is positive and significantly ($p<0.05$) associated with audit fees for the specialist auditors sample only. The coefficients of *QUICK*, *YE* and *INITIAL* are negative and significantly ($p<0.01$) associated with audit fees for both the non-specialist auditors and the specialist auditors samples. The coefficient on *ROA* is negative and significantly ($p<0.05$) associated with audit fees for the non-specialist auditors sample only. The coefficient on *AGE* is positive and significantly associated with audit fees for both the non-specialist auditor and the specialist auditor samples. The adjusted R^2 of these regression tests are 72.50 percent and 81.12 percent for the non-specialist and the specialist auditor samples respectively.

Table 19 reports the multiple regression results from testing the association between the logarithm of audit fees and our experimental variable *LAGDSP* and incorporating variable AGE as suggested by one of the examiners. The sample consists of firms audited by Big auditors only (*N*=12,905) and firms are split into firms that are audited by specialists auditors (*N*=3,945), and those firms audited by non-specialist auditors (*N*=8,960). Firms are classified as being audited by a specialist auditor if the auditor has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings. The coefficient of *LAGDSP* is positive and significant (0.018, $p<0.05$) only for the firms audited by non-specialist auditors. The coefficient of *LAGDSP* of the firms audited by specialist auditors whilst positive is not significant. This result supports hypothesis (H4b) that a positive association between audit fees and analysts' earnings forecast dispersion will be stronger when firms are audited by non-specialist auditors. This is because industry non-specialist auditors with less superior knowledge about the industry upon which their focus will be, compared to industry specialist auditors, are more likely to use the analysts' earnings forecast in their assessment of inherent risk. That is, more accurate analysts' earnings forecast accuracy for firms audited by non-specialist auditors will have a greater impact on the risk perceptions of auditors given the higher risk and higher information asymmetry. The coefficients of *LNAT, LNSEG, INVREC, LOSS* and

OPINION are positive and significantly (*p<0.01*) associated with audit fees for both the non-specialist auditors and the specialist auditors samples. The coefficient of *MERGER* is positive and significantly (*p<0.05*) associated with audit fees for the non-specialist auditors sample only. The coefficients of *QUICK*, *YE* and *INITIAL* are negative and significantly (*p<0.01*) associated with audit fees for both the non-specialist auditors and the specialist auditors samples. The coefficient of *FOREIGN* is positive and significantly (*p<0.05*) associated with audit fees for the specialist auditors sample only, while the coefficient of *MERGER* is positive and significantly (*p<0.05*) associated with audit fees for the non-specialist auditors sample only. The coefficient of ROA is negative and significantly (*p<0.05*) associated with audit fees for the non-specialist auditors sample only. The coefficient on *AGE* is positive and significantly associated with audit fees for both the non-specialist auditor and the specialist auditor samples. The adjusted R^2 of these regression tests are 72.49 percent and 81.12 percent for the non-specialist and the specialist auditor samples respectively.

Table 20 reports the industry distribution on Big 5 auditors based on two-digit SIC groupings (*N*=12,905) and firms are split into firms that are audited by specialists auditors (*N*=3,945), and those firms audited by non-specialist auditors (*N*=8,960). Firms are classified as being audited by a specialist auditor if the auditor has the

largest share of the industry's total sales revenue based on two-digit SIC industry groupings. The three largest industries based on two-digit SIC industry grouping are 73, 36 and 28 with 13.6% 12.9% and 10.9% of the population in the sample respectively. As such, there is no dominant industry that drives the report results.

4.8 Summary

The purpose of this chapter was to present the main results of this study that came from testing the hypotheses. This study seeks to investigate the effect of information asymmetry on the supply-side of audit pricing by using the lag of analysts' forecasts as a proxy for inherent risk. First, I examine whether there is any association between audit fees and the lag of analysts' earnings forecast (*LAGACCY* and *LAGDSP*). Using a sample of firms from 2000 to 2012, the results from testing the two proxies for inherent risk, both of these proxies (*LAGACCY* and *LAGDSP)* are found to be significantly associated with audit fees and in the predicted direction as expected. In addition, the results show that this association is less pronounced for larger firms, and for older firms. Additionally, the association between audit fees and both *LAGACCY* and *LAGDSP* are insignificant for firms that are audited by industry specialists. This lack of significance found in relation to these firm types

suggest that specialist auditors are more efficient in assessing client's inherent risk and, as such, rely to a lesser extent on information provided by financial analysts.

A number of sensitivity tests were conducted to ensure the robustness of the main results. First, the previous test on firm size is repeated effects using a different proxy for firm size. Instead of using total assets as a proxy for firm size, it is replaced by sales revenue. Second, the previous test for auditor industry specialization effects using a different proxy for audit specialist. Instead of using the share of industry's total sales revenue as a proxy for whether an audit firm is an audit specialist, the share of industry's total assets held by the audit firm as a proxy for audit industry specialisation is utilised. This designation is in line with studies investigated by Gramling and Stone (2001). The results that were obtained using these alternative definitions are substantially the same as reported when using the original definitions and are reported in table 10 (for Model 2) and Table 11 (for Model 3).

Additionally, concerns regarding endogeniety issues were identified and addressed using two-stage regression techniques. The concern here being addressed

whether an analyst's decision to follow a firm is an endogenous decision given that factors that influence the analysts' coverage can also influence both of the dependent variables (*ACCY* and *DSP*). Results following these tests being performed provide further confidence in the reported findings.

CHAPTER 5

CONCLUSIONS

5.1 Summary of this study

This study draws on information asymmetry theory and audit pricing theory to examine the linkage between analyst earnings forecasts properties and audit fees in the U.S. The research questions are motivated by the Behn et al. (2008) paper which provides evidence that analysts' forecast accuracy is higher, and analysts' forecast dispersion is lower, for firms audited by Big 5 audit firms. These authors find that analysts, being users of financial statements, are able to make more accurate earnings forecasts of clients of higher quality big audit firms. Additionally, these authors find that auditor industry specialization is similarly associated with higher analysts' forecast accuracy and lower analysts' forecast dispersion. The main research question asks whether it is possible that auditors rely on the work of financial analysts in their assessment of audit risk. This is because the financial analysts play an important informational role, and, as such, it is possible that they also provide useful information to auditors. This thesis provides an opportunity to address prior inconsistent results in the literature concerning fee premiums attributable to auditor industry specialists. Additionally, this study provides evidence of the effect of information asymmetry from the supply-side of auditing

perspective. Third, the results from this study complement findings of Behn et al. (2008) that analysts make more accurate earnings forecasts in the presence of higher quality audits. This study provides evidence that audit firms consider analysts' forecasts and analysts' dispersion in their information-gathering when assessing the perceived risk of their client firms. Fourth, this is the first study considering the association between analysts' forecast accuracy, and dispersion, and their association with auditor risk assessment and audit fees.

To investigate the effect of information asymmetry on the supply-side of audit pricing, the lag of analysts' forecast (*LAGACCY* and *LAGDSP*) as a proxy for inherent risk is utilised. *LAGACCY* is analysts' forecast accuracy in the previous fiscal year (year t-1) and *LAGDSP* which is the analysts' forecast dispersion in the previous fiscal year (year t-1). First, whether there is any association between audit fees and the lag of analysts' earnings forecast is examined. Analysts may affect auditors' risk assessment due to both their information and monitoring role. The information role of an analyst may help auditors to have a better understanding of the client's business and industry, and hence affect the auditors' assessment of the firm's inherent risk. As such, that those firms with higher inherent risks will be associated with lower analysts' forecast accuracy, and higher analysts' forecast

dispersion, and higher audit fees given that these firms have higher perceived assessed risk. This is in line with Gul (2007) who says that the audit fee charged is a function of the size and complexity of the firm, and the assessed audit risk of the audit client by the audit firm. Second, evaluate whether the association between audit fees and the lag of analysts' forecast is weaker for larger firms is considered. This is consistent with the expectation that small firms are associated with having higher levels of information asymmetry. It is argued that for these firms the association between forecast accuracy (and dispersion) and audit fees will be stronger. That is, a higher analysts' forecast accuracy in these firms to be associated with lower audit fees, and that greater dispersion for these firms will be associated with higher audit fees. This is because there is less information available for small firms, including less analyst following. The higher extent of information asymmetry present in these firms will make these firms inherently more risky as perceived by their auditors. It is posited that the presence of higher forecast accuracy by analysts on these firms will be informational to auditors, given that there is comparatively less information publicly available concerning them, and this will lead to a reduced perception of risk, and subsequent lower audit fees. For the same reasons, higher analysts' forecast dispersion for these firm types will lead auditors to perceive higher risk leading to comparatively higher audit fees. Third, this thesis evaluates

whether the association between audit fees and the lag of analysts' earnings forecast is stronger for younger firms. Younger firms have higher informational problems compared to older and more established firms as this should affect the auditors' assessment of inherent risk. Finally, whether the association between audit fees and the lag of analysts' forecast is weaker for firms audited by industry specialists is considered. Auditor industry specialists should be in a position to make higher quality professional judgments. They should be in a position to better assess their client's inherent risk and should comparatively rely less on information that is provided by financial analysts.

Using a sample of firms for the years 2000 to 2012, this study provides evidence that audit fees are negatively associated with analysts' earnings forecast accuracy, and is positively associated with analysts' forecast dispersion. Firms with higher inherent risks will be associated with lower analysts' forecast accuracy (and higher analysts' forecast dispersion), and this in turn is likely to impact the auditors' decision as to deploy greater resources in order to reduce detection risk so as to achieve an acceptable level of overall audit risk. It is found that these associations are stronger for (1) small firms (split at median total assets) and (2) young firms (split at the median firm age). This is consistent with theory that these firms have

higher information asymmetry problems. The higher extent of information asymmetry present in these firms will make these firms inherently more risky as perceived by their auditors and as such they are associated with higher audit fees. Finally, it is found that the association between audit fees and analysts' forecasts accuracy (and dispersion) are insignificant for firms that are audited by industry specialists. This finding provides support that auditor industry specialization plays a part in reducing information asymmetry with these audit firm types being less reliant on information provided by financial analysts.

The results from this study contribute to the literature by extending our understanding of risk perceptions by audit firms and provides evidence that these firms consider analysts' forecast accuracy, and dispersion, in their risk assessment and the subsequent pricing. Second, given the associations found in relation to small and young firms, and firms that employ the services of non-specialist audit firms, it is considered reasonable that analysts' forecast accuracy and dispersion serve as good proxies for inherent risk. Third, as a complement to the findings of Behn et al. (2008) who find that analysts make more accurate earnings forecasts in the presence of higher audit quality, the results indicate that audit firms take into consideration analysts' forecasts and dispersion in their information-gathering when assessing the

perceived risk of their client firms. Fourth, this is the first study considering the association between analysts' forecast accuracy, and dispersion, and their association with auditor risk assessment, and subsequent audit fees.

5.2 Limitation and future research

There are three main limitations identified in this study. First, the sample only covers data of publicly listed firms for years 2000 to 2012 and hence an external validity problem exists in that the results may not be transportable over other different time periods and locations. Second, only two analysts' earnings forecast properties, accuracy and dispersion, are considered as proxies for inherent risk. Whilst the results give confidence that these are good proxies for this, it is possible that other proxies may also exist. This possibility could be explored in future investigations. Third, only a demand-side perspective of the audit fees model is adopted. Ideally, a simultaneous structural equation model would be better, however this would require data that includes actual audit hours performed by the audit firms which were not available to us. Such information would provide increased confidence in the results and could be considered in future research.

Definitions of variables

Firm-specific variables

LAF	=	Natural logarithm of audit fees, expressed in US$.
LAGACCY	=	Forecast accuracy in year t-1
LAGDSP	=	Forecast dispersion in year t-1
LNAT	=	Natural logarithm of assets, expressed in millions of US$ (COMPUSTAT data item#6)
LNSEG	=	Natural logarithm of number of business segments.
INVREC	=	Inventory and receivables to assets ratio ([COMPUSTAT data item #2 + COMPUSTAT data item #3] / COMPUSTAT data item #6)
QUICK	=	Current assets minus inventories, divided by current liabilities.
LEVERAGE	=	Total liabilities divided by total assets (COMPUSTAT data item #9 / COMPUSTAT data item#6)
ROA	=	Return on assets (COMPUSTAT data item #178 / COMPUSTAT data item#6 in year *t-1*)
SALESGRWTH	=	Sales growth ([COMPUSTAT data item #12 - COMPUSTAT data item #12 in year t-1] / COMPUSTAT data item#12 in year *t-1*)
FOREIGN	=	1 if foreign currency translation is greater than zero, 0 otherwise. (COMPUSTAT data item#150)
MERGER	=	1 if firm was involved in merger activity, 0 otherwise.
YE	=	1 if non-December 31st year-end, 0 otherwise.
LOSS	=	1 if net loss is reported, 0 otherwise. (COMPUSTAT data item#172)
OPINION	=	1 if nonstandard audit report is issued, 0 otherwise. (COMPUSTAT data item#149)
BIGN	=	1 if the client is audited by Big 4 auditor, 0 otherwise.
INITIAL	=	1 if auditor tenure is less 2 years, 0 otherwise.
SURPRISE	=	Current year's earning minus last year's earnings deflated by stock price.

ZMIJ	=	Zmijewski 1984 financial distress prediction model based on: (-4.803 - 3.599*(net income / total assets)+5.406*(total debt / total assets) – 0.10 * (current assets / current liabilities).
HORIZON	=	Logarithm of the average number of calendar days between mean forecast announcement date and subsequent actual earnings announcement date.
STDROE	=	Standard deviation of earnings over the previous five years.
NANA	=	Logarithm of number of analyst following the firm.
EPS	=	Earnings per share.
AIS	=	Auditors' industry specialization and measured based on its share of clients' total sales revenue in the two-digit SIC industry group, and an auditor is assumed to be specialist in an industry if the auditor has the largest share of the industry's total sales revenue.
MILLS	=	Inverse Millis ratio obtained from a probit regression for analyst choice base on R. Bhushan (1989) model.
ACVR	=	1 if firm has an analyst issuing earnings forecast, 0 otherwise.
NINST	=	Number of institutions holding shares in the firm.
PCTGINST	=	Percentage of shareholding by all the institutions.
STDRET	=	Standard deviation of yearly stock return of a firm from 2000-2012.
RSQR	=	R-square between the daily market return and a firm's return from 2000-2012.
NLOB	=	Number of lines of business of a firm based on four-digit SIC codes.
LNMV	=	Logarithm of market value of equity.
PCTGINTERNAL	=	Percentage of share held by insiders.
AGE	=	Number of years since the firm's inclusion on the CRSP database.

Table 1

Descriptive statistics

All Firms (N = 14,789)

This table reports mean, median and standard deviation of the following variables. These variables are windsorized at both bottom and top 1% levels.

Variable	Mean	Median	Std Dev
Audit fees (in US$ million)	1.901	0.809	4.102
LAGACCY	-0.045	-0.005	3.159
LAGDSP	0.039	0.007	5.788
Total Assets (in US$ million)	4001.690	524.776	15453.450
Number of segment	3.845	3.000	3.760
INVREC	0.238	0.213	0.173
QUICK	2.683	1.690	3.499
LEVERAGE	0.145	0.080	0.190
ROA	0.056	0.082	0.874
SALESGRWTH	0.240	0.089	57.026
FOREIGN	0.138	0.000	0.345
MERGER	0.016	0.000	0.133
YE	0.297	0.000	0.457
LOSS	0.290	0.000	0.457
OPINION	0.392	0.000	0.487
BIGN	0.880	1.000	0.333
Audit tenure	7.933	7.000	6.468

Table 2

Pearson correlation matrix

Variable	LAG -ACCY	LAG -DSP	LNAT	LNSEG	INVREC	QUICK	LEVER -AGE	ROA	SALES-GRWTH	FOREIGN	MERGER	YE	LOSS	OPINION	BIGN	INITIAL
LAF	0.025 (0.00)	-0.028 (0.00)	0.761 (0.00)	0.327 (0.00)	-0.014 (0.009)	-0.263 (0.00)	0.184 (0.00)	0.067 (0.00)	0.002 (0.82)	0.105 (0.00)	0.062 (0.00)	-0.011 (0.19)	-0.213 (0.00)	0.176 (0.00)	0.244 (0.00)	-0.306 (0.00)
LAGACCY		-0.535 (0.00)	0.052 (0.00)	-0.003 (0.68)	0.013 (0.13)	0.006 (0.45)	-0.041 (0.00)	0.017 (0.04)	-0.001 (0.94)	-0.023 (0.00)	0.004 (0.59)	0.023 (0.01)	-0.081 (0.00)	-0.003 (0.68)	0.035 (0.00)	-0.034 (0.00)
LAGDSP			-0.057 (0.00)	-0.008 (0.32)	-0.026 (0.00)	-0.003 (0.70)	0.009 (0.27)	-0.025 (0.00)	0.001 (0.89)	0.001 (0.88)	-0.005 (0.55)	-0.025 (0.00)	0.081 (0.00)	0.005 (0.55)	-0.021 (0.01)	0.022 (0.01)
LNAT				0.293 (0.00)	-0.099 (0.00)	-0.271 (0.00)	0.296 (0.00)	0.097 (0.00)	0.011 (0.19)	0.066 (0.00)	0.044 (0.00)	0.012 (0.13)	-0.320 (0.00)	0.132 (0.00)	0.308 (0.00)	-0.178 (0.00)
LNSEG					0.110 (0.00)	-0.164 (0.00)	0.062 (0.00)	0.043 (0.00)	-0.001 (0.91)	0.040 (0.00)	0.045 (0.00)	0.018 (0.03)	-0.119 (0.00)	-0.006 (0.44)	0.022 (0.01)	0.001 (0.95)
INVREC						-0.272 (0.00)	-0.150 (0.00)	0.058 (0.00)	-0.002 (0.84)	0.045 (0.00)	-0.007 (0.38)	0.171 (0.00)	-0.162 (0.00)	-0.013 (0.11)	-0.102 (0.00)	0.018 (0.03)
QUICK							-0.203 (0.00)	-0.068 (0.00)	-0.007 (0.37)	-0.039 (0.00)	-0.017 (0.04)	-0.030 (0.00)	0.183 (0.00)	-0.078 (0.00)	-0.027 (0.00)	0.057 (0.00)
LEVERAGE								0.018 (0.02)	0.012 (0.14)	-0.021 (0.01)	-0.006 (0.48)	-0.116 (0.00)	0.032 (0.00)	0.068 (0.00)	0.010 (0.00)	-0.033 (0.00)
ROA									0.116 (0.00)	0.008 (0.33)	0.043 (0.00)	0.021 (0.01)	-0.177 (0.00)	-0.004 (0.64)	0.012 (0.13)	-0.033 (0.00)
SALESGRWTH										0.008 (0.34)	0.004 (0.62)	0.005 (0.55)	0.006 (0.49)	0.004 (0.67)	0.003 (0.71)	0.033 (0.00)
FOREIGN											0.002 (0.79)	-0.008 (0.36)	-0.036 (0.00)	0.033 (0.00)	0.016 (0.05)	0.025 (0.00)
MERGER												0.000 (0.99)	-0.012 (0.15)	-0.032 (0.00)	0.003 (0.74)	-0.028 (0.00)
YE													-0.089 (0.00)	0.010 (0.24)	-0.024 (0.00)	-0.080 (0.00)
LOSS														0.000 (0.99)	-0.045 (0.00)	0.076 (0.00)
OPINION															0.095 (0.00)	-0.079 (0.00)
BIGN																-0.165 (0.00)

P-Values (two-tailed) are reported in parentheses. (*N*=14,789)

Table 3

Multivariate tests on the association between logarithm of audit fee and experimental variables for Model (2) and (3)

$$LAF = \beta_0 + \beta_1 LAGACCY + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} AUDITOR + \beta_{15} INITIAL + \sum year + \sum industry + \varepsilon_1 \quad (2)$$

$$LAF = \beta_0 + \beta_1 LAGDSP + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} BIGN + \beta_{15} INITIAL + \sum year + \sum industry + \varepsilon_1 \quad (3)$$

Dependent Variable: Audit Fees (LAF) (N = 14,789)

	Predicted Sign	Model 2		Model 3	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	8.983	163.13***	8.982	163.05***
Control Variables					
LNAT	+	0.508	123.24***	0.509	123.39***
LNSEG	+	0.117	13.28***	0.118	13.31***
INVREC	+	0.453	9.79***	0.455	9.83***
QUICK	-	-0.021	-11.84***	-0.020	-11.78***
LEVERAGE	+/-	-0.075	-2.08**	-0.073	-2.01**
ROA	-	-0.011	-2.45**	-0.011	-2.45**
SALESGRWTH	-	0.000	0.39	0.000	0.38
FOREIGN	+	0.025	1.51	0.026	1.56
MERGER	+	0.060	1.68*	0.060	1.69*
YE	-	-0.117	-9.19***	-0.117	-9.18***
LOSS	+	0.173	12.80***	0.173	12.77***
OPINION	+	0.134	10.28***	0.134	10.26***
BIGN	+	0.199	10.48***	0.198	10.45***
INITIAL	-	-0.269	-12.06***	-0.269	-12.06***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.013	-1.75*		
LAGDSP	+			0.021	3.35***
Adj. R^2		74.61%		74.62%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the t-statistics are based on White's (1980) heteroscedasticity-corrected standard errors.

Table 4

Results from estimating Model (2) for firm size effects

Dependent Variable: Audit Fees (LAF) (*N* = 14,789)

Model 2: Small Firms (*N* = 7,395) and Large Firms (*N* = 7,394)

	Predicted Sign	Small Firms		Large Firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.391	121.12***	8.427	86.57***
Control Variables					
LNAT	+	0.448	42.22***	0.572	96.00***
LNSEG	+	0.006	0.43	0.178	15.89***
INVREC	+	0.134	2.20**	1.043	14.64***
QUICK	-	-0.020	-10.61***	-0.032	-8.24***
LEVERAGE	+	0.010	0.20	0.119	2.57**
ROA	-	-0.030	-1.57	-0.005	-1.27
SALESGRWTH	-	0.000	3.35***	0.000	-0.40
FOREIGN	+	0.021	0.81	0.038	1.87
MERGER	+	0.073	1.09	0.100	2.60**
YE	-	-0.066	-3.71***	-0.113	-6.53***
LOSS	+	0.148	8.07***	0.113	5.37***
OPINION	+	0.113	5.75***	0.150	8.95***
BIGN	+	0.270	12.14***	0.134	3.09***
INITIAL	-	-0.290	-10.63***	-0.246	-6.73***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.017	-3.29***	0.014	0.93
Adj. R^2		53.60%		70.83%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split at the median of total assets into small firms and large firms.

Table 5

Results from estimating Model (3) for firm size effects

Dependent Variable: Audit Fees (LAF) (*N* = 14,789)

Model 3: Small Firms (*N* = 7,395) and Large Firms (*N* = 7,394)

	Predicted Sign	Small Firms		Large firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.388	121.03***	8.425	86.57***
Control Variables					
LNAT	+	0.448	42.26***	0.572	96.04***
LNSEG	+	0.007	0.48	0.178	15.86***
INVREC	+	0.136	2.24**	1.042	14.64***
QUICK	-	-0.020	-10.54***	-0.032	-8.24***
LEVERAGE	+	0.015	0.30	0.117	2.54**
ROA	-	-0.029	-1.52	-0.005	-1.27
SALESGRWTH	-	0.000	3.35***	0.000	-0.40
FOREIGN	+	0.023	0.86	0.038	1.82*
MERGER	+	0.074	1.10	0.101	2.61**
YE	-	-0.066	-3.70***	-0.113	-6.52***
LOSS	+	0.148	8.10***	0.113	5.35***
OPINION	+	0.112	5.72***	0.150	8.94***
BIGN	+	0.269	12.12***	0.136	3.13***
INITIAL	-	-0.289	-10.61***	-0.246	-6.72***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGDSP	+	0.021	3.84***	-0.014	-0.96
Adj. R^2	-	53.61%		70.83%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split at the median of total assets into small firms and large firms.

Table 6

Results from estimating Model (2) for firm age effects

Dependent Variable: Audit Fees (LAF)

Model 2: Young Firms (*N* = 3,388) and Old Firms (*N* = 3,796)

	Predicted Sign	Young Firms		Old Firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	10.704	106.80***	9.232	80.27***
Control Variables					
LNAT	+	0.428	34.23***	0.605	73.35***
LNSEG	+	-0.020	-1.05	0.111	7.86***
INVREC	+	0.152	1.44	1.122	10.13***
QUICK	-	-0.023	-7.91***	-0.014	-1.49
LEVERAGE	+	0.042	0.50	0.050	0.64
ROA	-	0.002	0.31	-0.721	-4.50***
SALESGRWTH	-	0.000	1.75*	0.005	0.09
FOREIGN	+	0.023	0.54	0.045	1.60
MERGER	+	0.279	2.97***	0.049	0.87
YE	-	0.064	1.77*	-0.124	-5.20***
LOSS	+	0.039	1.31	0.132	3.56***
OPINION	+	0.229	7.93***	0.173	8.35***
BIGN	+	0.223	5.40***	0.007	0.16
INITIAL	-	-0.603	-18.45***	-0.485	-11.54***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.018	-1.91**	-0.037	-0.86
Adj. R^2		57.92%		80.06%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split into four quartiles by the number of years since inclusion on CRSP database, lower quartile being young firms and upper quartile being old firms.

Table 7

Results from estimating Model (3) for firm age effects

Dependent Variable: Audit Fees (LAF)

Model 3: Young Firms (*N* = 3,388) and Old Firms (*N* = 3,796)

	Predicted Sign	Young Firms		Old Firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	10.700	106.69***	9.234	79.78***
Control Variables					
LNAT	+	0.428	34.27***	0.604	73.31***
LNSEG	+	-0.020	-1.03	0.112	7.89***
INVREC	+	0.152	1.43	1.122	10.15***
QUICK	-	-0.023	-7.79***	-0.014	-1.51
LEVERAGE	+	0.045	0.53	0.054	0.68
ROA	-	0.002	0.31	-0.724	-4.46***
SALESGRWTH	-	0.000	1.72*	0.005	0.09
FOREIGN	+	0.021	0.50	0.045	1.59
MERGER	+	0.279	2.97***	0.049	0.87
YE	-	0.066	1.81*	-0.124	-5.21***
LOSS	+	0.036	1.22	0.133	3.59***
OPINION	+	0.230	7.98***	0.173	8.34***
BIGN	+	0.221	5.36***	0.007	0.17
INITIAL	-	-0.601	-18.43***	-0.484	-11.53***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY		*Yes*		*Yes*	
Experimental					
LAGDSP	+	0.043	2.26**	0.015	0.18
Adj. R^2		57.95%		80.05%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split into four quartiles by the number of years since inclusion on CRSP database, lower quartile being young firms and upper quartile being old firms.

Table 8

Results from estimating Model (2) for auditor industry specialization effects

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 2: Non-specialists (*N* = 8,960) and Specialists (*N* = 3,945)

	Predicted Sign	Non-specialist		Specialist	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.437	135.44***	8.749	89.81***
Control Variables					
LNAT	+	0.482	89.99***	0.534	76.32***
LNSEG	+	0.133	11.24***	0.129	6.93***
INVREC	+	0.508	8.13***	0.762	9.44***
QUICK	-	-0.022	-10.64***	-0.022	-4.67***
LEVERAGE	+	-0.057	-1.32	0.085	1.11
ROA	-	-0.009	-2.58***	-0.023	-0.54
SALESGRWTH	-	0.000	0.48	0.000	-1.96*
FOREIGN	+	0.006	0.29	0.059	2.08**
MERGER	+	0.102	2.23**	-0.013	-0.83
YE	-	-0.083	-4.77***	-0.212	-7.74***
LOSS	+	0.148	8.31***	0.172	5.26***
OPINION	+	0.140	8.35***	0.125	4.70***
INITIAL	-	-0.373	-11.15***	-0.205	-4.60***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.027	-2.88***	-0.025	-1.26
Adj. R^2		72.49%		81.02%	

****p*< 0.01; ***p*<0.05; **p*<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings.

Table 9

Results from estimating Model (3) for auditor industry specialization effects

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 3: Non-specialists (*N* = 8,960) and Specialists (*N* = 3,945)

	Predicted Sign	Non-specialists		Specialists	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.439	135.45***	8.750	89.68***
Control Variables					
LNAT	+	0.481	89.96***	0.545	76.36***
LNSEG	+	0.134	11.27***	0.106	6.96***
INVREC	+	0.508	8.13***	0.812	9.42***
QUICK	-	-0.022	-10.64***	-0.019	-4.64***
LEVERAGE	+	-0.052	-1.20	0.069	1.13
ROA	-	-0.009	-2.58***	-0.055	-0.54
SALESGRWTH	-	0.000	0.47	0.000	-1.96**
FOREIGN	+	0.006	0.31	0.068	2.14**
MERGER	+	0.102	2.24**	-0.052	-0.83
YE	-	-0.083	-4.76***	-0.182	-7.73***
LOSS	+	0.149	8.36***	0.173	5.25***
OPINION	+	0.141	8.38***	0.110	4.71***
INITIAL	-	-0.372	-11.13***	-0.210	-4.61***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY		*Yes*		*Yes*	
Experimental					
LAGDSP	+	0.018	2.25**	0.036	1.33
Adj. R^2		72.47%		81.02%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings.

Table 10

Robustness test using sales revenue for firm size effects

Dependent Variable: Audit Fees (LAF) (*N* = 14,789)

Model 2: Small Firms (*N* = 7,394) and Large Firms (*N* = 7,395)

	Predicted Sign	Small Firms		Large Firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.545	119.91***	8.584	93.44***
Control Variables					
LNAT	+	0.415	44.23***	0.562	91.83***
LNSEG	+	-0.001	-0.04	0.186	16.58***
INVREC	+	0.083	1.23	0.972	14.38***
QUICK	-	-0.022	-12.42***	-0.047	-6.31***
LEVERAGE	+	-0.118	-2.28**	0.173	3.47***
ROA	-	-0.011	-1.47	-0.005	-1.82*
SALESGRWTH	-	0.000	1.06	0.000	-0.80
FOREIGN	+	0.025	0.98	0.033	1.54
MERGER	+	0.071	1.09	0.087	2.20**
YE	-	-0.050	-2.73***	-0.128	-7.51***
LOSS	+	0.127	7.38***	0.153	6.85***
OPINION	+	0.113	5.83***	0.148	8.68***
BIGN	+	0.273	12.16***	0.168	3.90***
INITIAL	-	-0.282	-10.42***	-0.283	-7.54***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.017	-3.24***	0.015	0.87
Adj. R^2		54.96%		71.68%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split at the median of sales revenue into small firms and large firms.

Table 11

Robustness test using sales revenue for firm size effects

Dependent Variable: Audit Fees (LAF) (*N* = 14,789)

Model 3: Small Firms (*N* = 7,394) and Large Firms (*N* = 7,395)

	Predicted Sign	Small Firms		Large firms	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.543	119.80***	8.582	93.41***
Control Variables					
LNAT	+	0.415	44.22***	0.562	91.89***
LNSEG	+	0.000	0.01	0.186	16.56***
INVREC	+	0.085	1.26	0.971	14.38***
QUICK	-	-0.022	-12.37***	-0.047	-6.31***
LEVERAGE	+	-0.115	-2.21**	0.170	3.42***
ROA	-	-0.011	-1.43	-0.005	-1.82*
SALESGRWTH	-	0.000	1.05	0.000	-0.80
FOREIGN	+	0.026	1.04	0.032	1.50
MERGER	+	0.072	1.10	0.088	2.21**
YE	-	-0.050	-2.72***	-0.128	-7.50***
LOSS	+	0.128	7.40***	0.152	6.80***
OPINION	+	0.113	5.82***	0.148	8.69***
BIGN	+	0.273	12.13***	0.169	3.93***
INITIAL	-	-0.281	-10.39***	-0.283	-7.54***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGDSP	+	0.017	2.73***	-0.015	-0.37
Adj. R^2	-	54.96%		71.68%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms are split at the median of total assets into small firms and large firms.

Table 12

Robustness test Model (2) using total assets for auditor industry specialization effects

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 2: Non-specialists (*N* = 8,881) and Specialists (*N* = 4,024)

	Predicted Sign	Non-specialist		Specialist	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.438	135.01***	8.810	91.63***
Control Variables					
LNAT	+	0.486	90.94***	0.534	74.24***
LNSEG	+	0.126	10.59***	0.129	8.31***
INVREC	+	0.527	8.50***	0.762	8.71***
QUICK	-	-0.021	-9.96***	-0.022	-5.68***
LEVERAGE	+	-0.067	-1.55	0.085	1.38
ROA	-	-0.009	-2.51**	-0.023	-0.26
SALESGRWTH	-	0.000	0.49	0.000	-1.60
FOREIGN	+	0.011	0.55	0.059	1.88*
MERGER	+	0.084	1.85*	-0.013	-0.20
YE	-	-0.071	-4.12***	-0.212	-8.80***
LOSS	+	0.151	8.46***	0.172	5.47***
OPINION	+	0.136	8.05***	0.125	5.37***
INITIAL	-	-0.380	-11.26***	-0.205	-4.60***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.028	-3.02***	-0.023	-1.16
Adj. R^2		72.68%		80.28%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total assets based on two-digit SIC industry groupings.

Table 13

Robustness test Model (3) using total assets for auditor industry specialization effects

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 3: Non-specialists (*N* = 8,881) and Specialists (*N* = 4,024)

	Predicted Sign	Non-specialists		Specialists	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.439	135.45***	8.811	91.48***
Control Variables					
LNAT	+	0.481	89.96***	0.534	74.27***
LNSEG	+	0.134	11.27***	0.130	8.33***
INVREC	+	0.508	8.13***	0.761	8.69***
QUICK	-	-0.022	-10.64***	-0.022	-5.66***
LEVERAGE	+	-0.052	-1.20	0.086	1.40
ROA	-	-0.009	-2.58***	-0.023	-0.26
SALESGRWTH	-	0.000	0.47	0.000	-1.60
FOREIGN	+	0.006	0.31	0.061	1.93*
MERGER	+	0.102	2.24**	-0.013	-0.20
YE	-	-0.083	-4.76***	-0.212	-8.80***
LOSS	+	0.149	8.36***	0.173	5.48***
OPINION	+	0.141	8.38***	0.126	5.38***
INITIAL	-	-0.372	-11.13***	-0.205	-4.61***
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGDSP	+	0.018	2.25**	0.027	1.01
Adj. R ^{2}		72.47%		80.28%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total assets based on two-digit SIC industry groupings.

Table 14

Test of endogeneity for analysts' earnings forecast accuracy

	Predicted Sign	First-stage (Dep. Var.=ACCY)		Second stage (Dep. Var. = LAF)	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	0.186	5.87***	8.852	146.64***
Control Variables					
LNAT	+	-0.001	-0.71	0.526	105.20***
LNSEG	+			0.106	10.70***
INVREC	+			0.561	11.04***
QUICK	-			-0.022	-9.47***
LEVERAGE	+/-			-0.086	-2.23**
ROA	-			-0.209	-5.36***
SALESGRWTH	-			-0.000	-0.35
FOREIGN	+			0.058	3.22***
MERGER	+			0.100	2.23**
YE	-			-0.110	-7.89***
LOSS	+	-0.028	-10.70***	0.120	6.50***
OPINION	+			0.122	8.48***
BIGN	+	-0.001	-0.21	0.152	7.52***
INITIAL	-			-0.327	-17.14***
SURPRISE	-	-0.000	-9.32***		
ZMIJ	-	-0.004	-4.84***		
HORIZON	-	-0.043	-7.83***		
STDROE	-	-0.004	-3.65***		
NANA	+	0.054	1.82*		
EPS	?	-0.000	-0.13		
AIS	?	-0.001	-0.48		
MILLS	?	-0.095	-17.13***		
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-			-0.578	-2.76***
Adj. R^2		12.25%		72.86%	
N		11,786		11,245	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors.

Table 15

Test of endogeneity for variable *HORIZON* in the second stage with logarithm of audit fee for Model (9)

$$LAF = \beta_0 + \beta_1 LAGACCY + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} AUDITOR + \beta_{15} INITIAL + \beta_{16} HORIZON + \sum year + \sum industry + \varepsilon_1 \quad (9)$$

	Predicted Sign	Second stage (Dep. Var. = LAF)	
		Coefficient	White's t-values
Intercept	+ or -	8.732	41.00***
Control Variables			
LNAT	+	0.526	104.99***
LNSEG	+	0.106	10.70***
INVREC	+	0.561	11.03***
QUICK	-	-0.022	-9.48***
LEVERAGE	+/-	-0.087	-2.24**
ROA	-	-0.208	-5.34***
SALESGRWTH	-	-0.000	-0.34
FOREIGN	+	0.058	3.23***
MERGER	+	0.099	2.22**
YE	-	-0.110	-7.88***
LOSS	+	0.119	6.47***
OPINION	+	0.122	8.47***
BIGN	+	0.152	7.52***
INITIAL	-	-0.327	-17.12***
HORIZON	?	0.022	0.59
YEAR DUMMIES		*Yes*	
INDUSTRY DUMMIES		*Yes*	
Experimental Variables			
LAGACCY	-	-0.583	-2.78***
Adj. R^2		72.86%	
N		11,245	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors.

Table 16

Test of endogeneity for analysts' earnings forecast dispersion

	Predicted Sign	First-stage (Dep. Var.=DSP)		Second stage (Dep. Var. = LAF)	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	-0.118	-2.17**	8.877	74.78***
Control Variables					
LNAT	+	-0.004	-5.93***	0.526	103.41***
LNSEG	+			0.107	10.83***
INVREC	+			0.561	11.01***
QUICK	-			-0.022	-9.40***
LEVERAGE	+/-			-0.088	-2.22**
ROA	-			-0.208	-5.34***
SALESGRWTH	-			-0.000	-0.35
FOREIGN	+			0.057	3.19***
MERGER	+			0.100	2.23**
YE	-			-0.109	-7.83***
LOSS	+			0.125	6.84***
OPINION	+			0.124	8.62***
BIGN	+	0.002	0.97	0.154	7.62***
INITIAL	-			-0.325	-17.03***
SURPRISE	+	0.001	15.60***		
ZMIJ	+	0.009	12.34***		
HORIZON	+	0.035	7.43***		
STDROE	?	0.005	5.56***		
AIS	?	0.002	1.28		
MILLS	?	0.079	18.29***		
YEAR DUMMIES		*Yes*		*Yes*	
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGDSP	+			0.572	2.51**
Adj. R^2		14.06%		72.82%	
N		11,831		11,288	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors.

Table 17

Test of endogeneity for variable *HORIZON* in the second stage with logarithm of audit fee for Model (10)

$$LAF = \beta_0 + \beta_1 LAGDSP + \beta_2 LNAT + \beta_3 LNSEG + \beta_4 INVREC + \beta_5 QUICK + \beta_6 LEVERAGE + \beta_7 ROA + \beta_8 SALESGRWTH + \beta_9 FOREIGN + \beta_{10} MERGER + \beta_{11} YE + \beta_{12} LOSS + \beta_{13} OPINION + \beta_{14} BIGN + \beta_{15} INITIAL + \beta_{16} HORIZON + \sum year + \sum industry + \varepsilon_1 \quad (10)$$

	Predicted Sign	Second stage (Dep. Var. = LAF)	
		Coefficient	White's t-values
Intercept	+ or -	8.700	37.00***
Control Variables			
LNAT	+	0.526	103.20***
LNSEG	+	0.107	10.83***
INVREC	+	0.560	11.00***
QUICK	-	-0.022	-9.42***
LEVERAGE	+/-	-0.089	-2.25**
ROA	-	-0.207	-5.32***
SALESGRWTH	-	-0.000	-0.35
FOREIGN	+	0.057	3.20***
MERGER	+	0.100	2.23**
YE	-	-0.109	-7.81***
LOSS	+	0.125	6.80***
OPINION	+	0.124	8.60***
BIGN	+	0.154	7.62***
INITIAL	-	-0.325	-17.00***
HORIZON	?	0.033	0.87
YEAR DUMMIES		*Yes*	
INDUSTRY DUMMIES		*Yes*	
Experimental Variables			
LAGDSP	+	0.582	2.55**
Adj. R^2		72.82%	
N		11,288	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors.

Table 18

Robustness test Model (2) for auditor industry specialization effects incorporating variable *AGE*

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 2: Non-specialists (*N* = 8,960) and Specialists (*N* = 3,945)

	Predicted Sign	Non-specialist		Specialist	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.456	134.85***	8.782	90.48***
Control Variables					
LNAT	+	0.477	81.25***	0.530	63.84***
LNSEG	+	0.129	10.64***	0.095	6.14***
INVREC	+	0.492	7.77***	0.785	9.20***
QUICK	-	-0.021	-10.51***	-0.019	-4.61***
LEVERAGE	+	-0.051	-1.18	0.092	1.48
ROA	-	-0.008	-2.48**	-0.048	-0.49
SALESGRWTH	-	0.000	0.62	-0.000	-1.13
FOREIGN	+	0.009	0.44	0.070	2.21**
MERGER	+	0.102	2.25**	-0.060	-0.96
YE	-	-0.090	-5.00***	-0.190	-8.09***
LOSS	+	0.150	8.42***	0.175	5.42***
OPINION	+	0.139	8.25***	0.106	4.57***
INITIAL	-	-0.370	-10.99***	-0.200	-4.36***
AGE	+	0.002	2.29***	0.004	4.20***
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGACCY	-	-0.027	-2.89***	-0.027	-1.32
Adj. R^2		72.50%		81.12%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings.

Table 19

Robustness test Model (3) for auditor industry specialization effects incorporating variable *AGE*

Dependent Variable: Audit Fees (LAF) (*N* = 12,905)

Model 3: Non-specialists (*N* = 8,960) and Specialists (*N* = 3,945)

	Predicted Sign	Non-specialists		Specialists	
		Coefficient	White's t-values	Coefficient	White's t-values
Intercept	+ or -	9.458	134.86***	8.783	90.35***
Control Variables					
LNAT	+	0.477	81.21***	0.530	63.86***
LNSEG	+	0.129	10.67***	0.095	6.18***
INVREC	+	0.493	7.77***	0.784	9.18***
QUICK	-	-0.022	-10.51***	-0.019	-4.59***
LEVERAGE	+	-0.046	-1.07	0.093	1.51
ROA	-	-0.008	-2.48**	-0.048	-0.49
SALESGRWTH	-	0.000	0.61	-0.000	-1.14
FOREIGN	+	0.009	0.46	0.072	2.28**
MERGER	+	0.103	2.26**	-0.060	-0.96
YE	-	-0.090	-4.98***	-0.190	-8.08***
LOSS	+	0.151	8.47***	0.175	5.42***
OPINION	+	0.139	8.28***	0.107	4.59***
INITIAL	-	-0.368	-10.96***	-0.201	-4.37***
AGE	+	0.002	2.27**	0.004	4.18***
INDUSTRY DUMMIES		*Yes*		*Yes*	
Experimental Variables					
LAGDSP	+	0.018	2.24**	0.037	1.32
Adj. R ^{2}		72.49%		81.11%	

***p< 0.01; **p<0.05; *p<0.1. The asterisks indicate significance levels in a 2-tailed test. All tests performed in this study controls for industry and year (not reported in tables). All of the *t*-statistics are based on White's (1980) heteroscedasticity-corrected standard errors. The sample firms consist of firms audited by Big 5 auditors only and are split into firms that are audited by industry specialist and non-specialist. Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings.

Table 20

Industry distribution on specialist and non-specialist auditors

SIC	No of observation			Percentage		
2-digit	Specialist	Non-specialist	Total	Specialist	Non-specialist	Industry
01	14	5	19	73.7%	26.3%	0.1%
02	1	0	1	100.0%	0.0%	0.0%
07	11	0	11	100.0%	0.0%	0.1%
10	13	40	53	24.5%	75.5%	0.4%
12	10	10	20	50.0%	50.0%	0.2%
13	145	252	397	36.5%	63.5%	3.1%
14	7	12	19	36.8%	63.2%	0.1%
15	3	2	5	60.0%	40.0%	0.0%
16	23	8	31	74.2%	25.8%	0.2%
17	10	2	12	83.3%	16.7%	0.1%
20	88	210	298	29.5%	70.5%	2.3%
21	7	0	7	100.0%	0.0%	0.1%
22	13	2	15	86.7%	13.3%	0.1%
23	32	81	113	28.3%	71.7%	0.9%
24	12	49	61	19.7%	80.3%	0.5%
25	29	77	106	27.4%	72.6%	0.8%
26	69	92	161	42.9%	57.1%	1.2%
27	27	81	108	25.0%	75.0%	0.8%
28	160	1250	1410	11.3%	88.7%	10.9%
29	42	65	107	39.3%	60.7%	0.8%
30	36	103	139	25.9%	74.1%	1.1%
31	20	42	62	32.3%	67.7%	0.5%
32	22	26	48	45.8%	54.2%	0.4%
33	86	80	166	51.8%	48.2%	1.3%
34	55	108	163	33.7%	66.3%	1.3%
35	283	602	885	32.0%	68.0%	6.9%
36	526	1143	1669	31.5%	68.5%	12.9%
37	35	243	278	12.6%	87.4%	2.2%
38	347	820	1167	29.7%	70.3%	9.0%
39	30	18	48	62.5%	37.5%	0.4%
40	15	53	68	22.1%	77.9%	0.5%
41	6	7	13	46.2%	53.8%	0.1%
42	76	53	129	58.9%	41.1%	1.0%
44	54	91	145	37.2%	62.8%	1.1%
45	62	56	118	52.5%	47.5%	0.9%
46	14	10	24	58.3%	41.7%	0.2%
47	19	70	89	21.3%	78.7%	0.7%
48	133	398	531	25.0%	75.0%	4.1%

SIC	No of observation			Percentage		
2-digit	Specialist	Non-specialist	Total	Specialist	Non-specialist	Industry
49	7	3	10	70.0%	30.0%	0.1%
50	183	144	327	56.0%	44.0%	2.5%
51	82	106	188	43.6%	56.4%	1.5%
52	25	31	56	44.6%	55.4%	0.4%
53	40	62	102	39.2%	60.8%	0.8%
54	11	38	49	22.4%	77.6%	0.4%
55	50	53	103	48.5%	51.5%	0.8%
56	96	110	206	46.6%	53.4%	1.6%
57	27	41	68	39.7%	60.3%	0.5%
58	70	133	203	34.5%	65.5%	1.6%
59	91	219	310	29.4%	70.6%	2.4%
70	10	22	32	31.3%	68.8%	0.2%
72	15	22	37	40.5%	59.5%	0.3%
73	479	1280	1759	27.2%	72.8%	13.6%
75	13	0	13	100.0%	0.0%	0.1%
78	8	11	19	42.1%	57.9%	0.1%
79	38	82	120	31.7%	68.3%	0.9%
80	39	165	204	19.1%	80.9%	1.6%
81	7	6	13	53.8%	46.2%	0.1%
82	35	41	76	46.1%	53.9%	0.6%
83	8	22	30	26.7%	73.3%	0.2%
87	76	208	284	26.8%	73.2%	2.2%
Total	3,945	8,960	12,905			100%

Firms are classified as being audited by a specialist audit firm if the audit firm has the largest share of the industry's total sales revenue based on two-digit SIC industry groupings.

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