An analysis of the effect of audit effort (hours) on stock price volatility: evidence of increasing demand reducing uncertainty

Abstract

This study uses unique South Korean data to demonstrate whether the public disclosure of audit hour (effort) information influences investor sentiment, proxied by stock price volatility. Over the 2005-2018 sample period, empirical results show that clients that secure increasing levels of audit hours enjoy lower stock price volatility. Furthermore, incrementally higher levels of audit hours reduce stock price volatility to a greater extent for Big4 clients, compared to Non-Big4 clients. Results are consistent after performing various additional tests including endogeneity, fixed/year effects, and after controlling for the audit fee premium effect. The aforementioned findings are interpreted from an audit demand theory perspective. More specifically, following South Korea's unique audit hour disclosure policy, market participants can make audit quality assertions using audit hour information, which influences investment/disinvestment speculation. Given that audit hour information reporting is rare internationally, the results have important audit policy and business planning implications.

Keywords: audit effort, audit hours, stock price volatility, business risk, audit policy

I. Introduction

Evidence of the effect of audit effort on stock price volatility is limited but mixed in the extant literature. Audit effort is shown to have a negative association with stock price volatility (Clinch et al., 2012; Godbey and Mahar, 2004; Jorjani and Safari Gerayeli, 2018). However, there is also evidence of a positive relationship (Gul et al., 2010; Su et al, 2016). DeFond and Zhang (2014) conduct an in-depth analysis of the audit quality/effort literature. They surmise mixed results exist because different audit effort proxies are utilized to make assertions in individual studies (Big4 audit firms, audit fees or audit tenure). Whilst numerous audit effort proxies exist, DeFond and Zhang (2014) report that audit hours can be considered a felicitous audit effort proxy, because they are a representation of the effort imparted by audit firms to conduct substantive and control tests. Following audit failures, South Korea is a rare instance where audit hour/effort information is transparently reported on Annual Reports (Choi et al., 2017). Whilst audit hour information is rare, it is shown to influence borrowing costs in South Korea (Jung, 2016; Mali and Lim, 2021). However, whether audit hours influence investor perceptions remains a question left unanswered. This study therefore has several motivations. First, to extend the auditing literature, we are motivated to demonstrate whether a policy to publicly report audit hour information can influence investment speculation.

Second, the study is motivated to disentangle audit demand/supply theory assertions in the context of stock price volatility. Based on audit demand theory, audit hours are shown to be demanded by clients to enhance audit quality (Carrington, 2010; DeFond and Zhang, 2014; Jung 2016; Simunic, 1980). However, due to a lack of audit hour data, the audit hour/effort literature is limited. On the other hand, based on audit supply theory, audit firms are shown to demand a fee/risk premium for bearing audit risk

(Cahan et al., 2011; Campa, 2013; Choi et al., 2021; Gul et al., 2003; Habib et al., 2018; Kinney Jr. et al., 2004; Lyon and Maher, 2005; Simunic and Stein, 1996; Yang et al., 2018). To disentangle audit fee/hour assertions, Korean studies utilise audit i) hours, ii) fees, and iii) fees per hour as audit inputs to show that audit hours are only used by management for signalling purposes, or demanded by stakeholders, if audit fees (fee per hour) do not increase at a higher rate to audit hours. (Lim and Mali, 2020; Mali and Lim 2020, 2021). Furthermore, Mali and Lim (2023) develop a model to capture the fee premium required by audit firms to mitigate litigation risk and reputational damage. Based on the above, we surmise that hours are also likely to only have a positive effect on investor confidence, hence reduce sock price volatility, when audit hours do not require a fee premium. Thus, by providing evidence in support of the above supposition, the study can extend the limited audit demand theory literature.

Third, it is widely accepted that the audit quality of Big4 audit firms is higher compared to Non-Big4 audit firms (Chi and Weng, 2014; DeAngelo, 1981; Fung et al., 2016; Gray and Ratzinger, 2010; Simon and Taylor, 2002). Therefore, there is the potential that high levels of audit effort/hours secured by a Big4 client can be perceived differently compared to NonBig4 clients. Due to audit quality assertions, we surmise that Big4 clients are likely to have lower stock price volatility, compared to NonBig4 clients, as audit hours/effort increase. Empirical evidence of the above relationship can extend the Big/NonBig4 audit quality literature. Fourth, audit effort/hour information is rare internationally. However, critics argue that opaque audit hour/effort transparency increases audit time stress (Guénin-Paracini, 2014; Lambert et al., 2017) and reduces earnings quality (Ettredge, et al., 2014). By providing evidence that the transparent public reporting/disclosure of audit effort/hour information is informative to market participants, the study can have policymaking implications.

OLS regression analysis is conducted using a sample of Korean listed firms for the 2005-2018 sample period. Empirical results demonstrate that there is a negative association between audit hours and stock price volatility. The results can be interpreted as follows. Increasing audit hours is perceived as reducing audit risk by investors. As a result, investors are likely to have higher confidence. Thus, investors are less likely to make speculative investments/disinvestments in firms with high audit hours/effort. To the best of our knowledge, this is the first study to demonstrate this association empirically. Audit fees are shown to have a positive association with stock price volatility. Audit fee per hour is shown to reduce with stock volatility. Consistent with previous studies, the results infer that audit hours only influence stakeholder decision making when no fee premium is attached to increasing audit hours. Next, a battery of tests are conducted after i) replacing stock price volatility market beta, ii) conducting standard error and fixed effects tests, and iii) controlling for endogeneity. The model is shown to be free from endogeneity, and results remain qualitatively indifferent for all analyses. A unique contribution is that increasing audit hours provided by Big4 auditors reduces stock price volatility to a higher extent compared to NonBig4 auditors. The study therefore provides evidence that market participants perceive audit hours/effort imparted by clients differently, compared to Big4/NonBig4 audit firms.

To avoid unnecessary repetition, the contributions associated with the above motivations, as well as management and business strategy implications are discussed in-depth, in the conclusion section. The paper proceeds as follows. In the next section, we review relevant literature and develop the hypothesis. In section III, the research design is introduced. Section IV provides the results of the main analysis. Additional analysis results are included in section V. Section VI concludes and provides a discussion.

II. Literature review and hypothesis

2.1. Literature review

It is established in the literature that market participants are risk averse and demand additional compensation for bearing risk (Black and Scholes 1973; Fama and French, 1992; Fama and French, 2016; Lintner, 1965; Markowitz, 1952; Sharpe, 1964). An investor's expected return is based on a risk-free rate (unsystematic risk); with additional returns being expected based on market risk, captured as beta (systematic risk). Beta is a scaled measurement of firm stock price volatility, which is considered to be a measurement of firm investment risk. Roll (1998) explains that market information only explains a small fraction of stock price volatility, suggesting that firm level information is a direct driver for stock price variations. It accepted that firm characteristics such as size, business complexity, leverage and age influence stock price volatility. Increasingly, there is evidence that firm characteristics such as managerial ability (Wu et al., 2020) and corporate culture (Xu, 2020) influence stock price volatility. However, surprisingly, very few studies associate stock price volatility with audit effort. Furthermore, there is evidence of both a positive and negative association between audit effort and stock price volatility.

Using a sample of Chinese firms, Gul et al. (2010) report that stock price volatility increases as Non-Big4 auditors are replaced by Big4 auditors. The positive association is based on the supposition that stock market synchronicity reduces as an incumbent Non-Big4 auditor is replaced by a Big4 auditor. Su et al. (2016) report that stock price volatility increases with audit tenure, suggesting that increased audit knowledge is associated with information quality, which increases investor confidence to speculate. The above results are interpreted on the basis that lower levels of stock price volatility have been associated

with weak investor protection (Morck et al., 2000), lower transparency (Jin and Myers, 2016) agency problems (Cheung and Jiang, 2016) and governance (Ferreira and Laux 2001; Haggard, et al., 2008; Gul et al., 2011).

On the other hand, Jorjani and Safari Gerayeli (2018) report that audit tenure reduces stock price volatility. Jorjani and Safari Gerayeli (2018) surmise that market participants perceive increasing tenure as increasing audit quality, which reduces stock price volatility because investors are less likely to speculate in a firm with higher audit quality. Godbey and Mahar (2004) report that following the disclosure of the Enron scandal, the stock price volatilities of Andersen's former client's increased, implying that perceived weak audit quality increased speculation. Clinch et al. (2012) conduct an analysis with stock price volatility representing information asymmetry, with audit firm characteristics representing audit quality. They find that stock price volatility is negatively associated with audit quality characteristics, including Big4 and industry speciality.

DeFond and Zhang (2014) provide a comprehensive overview of the audit effort/quality literature. They assert that the association between audit effort and stock price volatility is mixed because various audit inputs exist to proxy for audit effort. Whilst there are two different interpretations to explain how audit effort can influence stock price volatility, we posit that the most likely relationship is that a negative association will exists, based on the established view that stock price volatility reflects investors' firm specific risk perceptions to invest/disinvest, based on confidence (Chakravarty et al., 2004). However, because differing relationships are reported, the literature can be extended with studies that demonstrate the association between audit effort and stock price volatility, using a well-defined audit effort proxy.

Based on Simunic's seminal assertion (1980), audit effort is constrained by two incentives, i) the incentives of clients to demand audit effort to secure sufficient audit services to enhance audit quality (demand theory), and ii) the constraint of audit firms to supply audit effort based on audit firms' incentives to minimize litigation risk and reputational damage (supply theory). Audit supply theory implies that audit firms have a strong incentive to reduce audit risk because audit failures have a direct effect on an audit firm's business (Simunic, 1980; Skinner and Srinivasan, 2012; Weber et al., 2008). To control business risk, countless studies show audit firms require an audit fee premium based on client risk (Cahan et al., 2011; Campa, 2013; Choi et al., 2021; Gul et al., 2003; Habib et al., 2018; Kinney Jr. et al., 2004; Lyon and Maher, 2005; Simunic and Stein, 1996; Yang et al., 2018). However, audit fees as an audit effort proxy have limitations. For example, it is well established that Anderson collected audit fees from Enron, who did not perform substantive and control tests (Duska, 2003; Markelevich et al., 2005). Furthermore, whilst the majority of studies associate audit fees with a risk premium, other studies interpret audit fees as an audit effort input associated with enhanced financial reporting quality (Gul and Goodwin, 2010; Jallow et al., 2012; Li et al., 2020) and governance (Hay, 2008, 2013). Therefore, audit fees can be considered a robust measure of audit risk. However, audit fees can be considered an imprecise measure of audit effort because audit fees include both a i) fee premium, as well as ii) a client's demand to enhance financial reporting quality.

Audit demand theory suggests that additional audit effort (hours) has the potential to 'add value' (DeFond and Zang, 2014). Various stakeholders including management (Carrington, 2010; Kim et al., 2012), shareholders (Lobo and Zhao, 2013; Esplin et al., 2018), amongst others (Espin et al., 2018) are shown to demand audit effort to reduce information asymmetry and enhance financial reporting quality. Audit demand

theory implies that audit effort (input) increases audit quality (output). Early studies report that audit hours increase with firm risk characteristics based on the assumption that audit firms would spend more of their valuable resources on high-risk clients as opposed to clients with low risk (Deis and Giroux, 1992; Niemi, 2005; O'Keefe et al., 1994). However, more recently, studies suggest that audit firms accommodate the demands of clients. Caramanis and Lennox (2008) show that increasing audit hours reduces a firm's overall business risk by reducing earnings management. Jung (2016) reports that market participants perceive audit hours as a signal of firm risk. Mali and Lim (2021) report that management demand increasing level of audit effort in hours as a signalling strategy, based on evidence that audit hours are economically significant in reducing WACC. The results imply that capital providers monitor audit hours, and reward firm with higher audit effort with reduced finance costs.

There is also South Korean evidence that market participants distinguish between audit hour/effort/demand and audit fee/risk/supply assertions. Using a sample of Korean firms, Mali and Lim (2020) demonstrate that based on legitimacy theory, firms with higher relative efficiency signal firm quality using audit hours. The study implies that management with higher performance have an incentive to secure audit hours into audit contracts to reduce objections to performance related pay. However, audit hours are only demanded if audit fees/per hour do not increase at a higher rate to audit hours. Lim and Mali (2020) show that firms with higher credit ratings demand high audit hours as a signalling strategy to demonstrate robust financial reporting quality, however, only if an audit fee/per hour premium is not imparted by audit firms. The results imply that because audit hours information is publicly available in Korea, audit hours are included into audit contracts to reduce agency problems and for signalling purposes. However, there is the potential that audit i) hours, ii) fees` and iii) fee per hours can be perceived

differently based on audit demand/supply theory assertions. However, empirical evidence of the aforementioned assertion is not demonstrated in the extant literature.

2.2. Korean audit profession

A South Korea sample has been selected because it can be considered a well-suited environment to capture the effect of audit hours/effort (fee, fee per hour) on stock price volatility. South Korea has experimented with various policies to enhance audit/financial reporting quality (Lim and Mali, 2022, 2023). As of 1997, clients were required to retain the services of an audit firm for at least 3 years. However, following numerous high-profile financial crises from 1998-2000, including major conglomerates such as Daewoo and SK Global, South Korean legislators were required to consider more robust audit policies to restore public confidence in the audit profession. In 2003, the mandatory audit firm rotation policy which is now currently used in Europe since 2016 was introduced. The policy only lasted until 2010 because the policy was not considered effective based on audit quality reductions and the additional cost associated with double regulation (Mali and Lim, 2018; Choi et al., 2017). However, a policy that was introduced in 2001 is the Client Engagement Policy. The Client Engagement Policy requires all auditors/clients to list audit hours (and fees) on Annual Reports as a rule. The policy remains active in 2023.

The purpose of introducing audit effort information on Annual Reports was to enhance audit quality and financial reporting transparency. However, a by-product of this policy is that South Korean market participants have unique audit effort data to base investment decisions. In the majority of countries, audit hour information simply does not exist. In South Korea, a country where there have been major financial collapses as a result of low earning/audit quality, audit hour information is available on a structured,

consistent and transparent year-on-year basis. Therefore, investors are able to consider two firms to be equal in terms of financial characteristics, however, they are also able to differentiate between firms that have secured higher and lower levels of audit hours into audit contracts.

2.3. Hypothesis development

We hypothesize that firms with higher (lower) audit hours will demonstrate lower (higher) stock price volatility, based on two assertions. First, audit hours can be considered a felicitous measure of audit effort because they indicate the level of substantive and control tests imparted by audit firms (DeFond and Zhang, 2014). Audit hours can therefore be perceived by investors as an indicator of audit quality. Following the introduction of Client Engagement Policy, as a strategy to increase public confidence in the accounting profession, it is expected that audit effort information influences investment decision making. Furthermore, based on agency theory, increasing audit effort is shown to be demanded by shareholders to reduce information asymmetry (Esplin et al., 2018; Lobo and Zhao, 2013; Watts and Zimmerman, 1983). Taken together, market participants are likely to infer that clients that secure audit hours into audit contracts have higher audit quality and lower agency problems. Thus, based on an audit demand theory, we interpret (potential) investors are less likely to speculate in firms with high levels of audit hours.

Second, increasing stock price volatility has a negative effect on business planning. There is evidence that management secure high levels of audit hours into audit contracts as a signalling strategy to demonstrate financial reporting (Jung, 2016; Lim and Mali, 2020; Mali and Lim, 2020, 2021). It is common knowledge that investors use all available

information when making investment decisions (Jensen and Meckling, 1976). Therefore, in an attempt to manage capital for business planning purposes, we hypothesize that because audit hour information is reported on a transparent basis on Annual Reports, again, based on audit demand theory, management have the potential to meet the expectations of market participants by securing high levels of audit hours. This assertion is supported by studies that shows audit effort is value adding for management to enhance business systems and controls (Carrington, 2010; Kim et al., 2012; DeFond and Zhang, 2014).

Taken together, clients with higher audit hours can be considered as having higher financial reporting quality. As a result, (potential) investors would be less inclined to speculate in firms with high audit effort, lowering stock price volatility. Investors would be more inclined to speculate in firms with low audit effort, increasing stock price volatility. Based on the above, the following hypothesis is introduced:

H1: Increasing levels of audit hours/effort reduce stock price volatility

III. Research design

3.1. Model development

In equation (1), the main OLS regression model is illustrated. All variables and definitions are provided in Table 1, Panel A. The dependent variable, stock price volatility (SPV) is estimated as the standard deviation of yearly stock returns multiplied by the square root of trading days. The independent variable of interest, audit hours is calculated as the natural logarithm of a firm's audit hours. As explained in the hypothesis, the relationship between stock price volatility and audit hours is likely negative. The remaining independent variables and their relationship with SPV are listed in Table 1.

$$SPV_{i,t} = \beta_0 + \beta_1 Audit\ effort_{i,t} + \beta_2 Size_{i,t} + \beta_3 Investment_{i,t} + \beta_4 Big4_{i,t} + \beta_5 TobinQ_{i,t} + \beta_6 Age_{i,t} + \beta_7 Lev_{i,t} + \beta_8 Loss_{i,t} + \beta_9 ROA_{i,t} + \beta_{12} Bigown_{i,t} + YD + ID + \varepsilon_{i,t} \quad (1)$$

There is evidence stock price volatility is lower for established firms relative to small firms (Liu and Lai, 2012; Shan et al., 2013); thus, *size* is likely to have a negative relationship with SPV. Fama and French (1992) suggest that market to book value can enhance the predictive validity of CAPM to infer market risk, based on investor confidence. As a result, Tobin Q is likely to have a negative association with stock price volatility. Older firms are established, thus present lower levels of stock price volatility (Shan et al., 2013). Therefore, we expect a negative relation between *age* and SPV. Following Black and Scholes (1973), numerous studies show that leverage is likely to have a positive influence on SPV, an observation commonly acknowledged as the 'leverage effect'. We include *Investment* as a proxy that captures cash-based leverage. Cash-leverage is also expected to be positively associated with stock price volatility. As shown in previous studies, stock price volatility is likely to increase based on economic *loss* (Clinch et al., 2012). Firm performance is proxied using ROA. Firms with higher levels of ROA are shown to demonstrate lower levels of volatility (Pagach and Warr, 2010). We include the percentage ownership of the largest domestic shareholder as a governance proxy. Previous studies show that large shareholders demand governance in the form of financial reporting quality (Liu et al., 2018). Therefore, as the percentage holding of the largest owner increases, the shareholder is likely to have the power to ensure that governance controls are robust. Finally, we add ID/YD dummy variables to control for

industry and year fixed effects. ID are 0/1 dummy variables, based on industry SIC codes. YD take the value of 1 for a specific year, 0 otherwise.

<Insert Table 1 here>

In Table1 Panel B, the sample selection process is explained. The sample period is from 2005 to 2018. Excluding financial firms, all firms listed on the Korean stock exchange are downloaded from the New KIS-Value, TS2000 and DataGuide5.0 databases. The initial population consists of 14,736 firm-year observations. 3,697 observations are excluded because audit hour/ financial information is not available, leaving a final sample of 11,039 firm-year observations. In Panel C, Table 1, the sample distribution, mean and median values for audit hours and SPV are listed by industry. Electronic Components, Computer, Radio, TV/Beverages industries have the highest/lowest number of observations (1403 obs, 12.71%/ 103 obs, 0.93%). Electricity industry/Fabricated metal products industry are found to have the highest (Mean value 6.93)/lowest(Mean value 6.01) levels of audit effort. It is observed that the Publishing activities industry/Professional services industry have the highest (Mean value 69.79)/lowest (Mean value 50.68) average level of stock price volatility.

VI. Empirical results

4.1. Univariate/bivariate analysis

In Table 2, univariate and bi-variate tests, mean, medians, maximum and minimum values for all variables are shown. Each variable is winsorized at top and

bottom 1% in order to minimize the outlier effect. The mean and median levels for all variables are almost at parity for all variables except for the *Big4* and *Loss* dummy variables, suggesting a normal sample. Pearson correlations provide expected results, consistent with predicted signs. Overall, audit effort is increasing with business complexity and risk proxies. For example, a positive relationship exists between leverage and audit fee (0.16) and audit effort in hours (0.06). Whilst both results are positive, the association between leverage (risk) and audit effort is stronger for audit fees compared to audit hours. The relation between stock price volatility and audit fee (-0.25) / audit hours (-0.24) is negative. The result imply that without controlling for firm risk characteristics, increasing audit effort reduces stock price volatility for both audit effort proxies. However, the relationship between audit hours and audit fees is 0.60. The result implies that the relationship between audit fees and hours is not monotonic, implying audit fees and hours can be considered as different forms of audit effort, consistent with previous studies (Lim and Mali, 2020; Mali and Lim, 2020, 2021). For brevity, we include a full interpretation of the relationship between both audit fees/hours and stock price volatility in Table 4.

<Insert Table 2 here>

4.2. Multi-variate analysis

In Table 3, main analysis results are provided. Empirical results demonstrate that audit effort proxied by audit hours has a significant negative association with stock price volatility (Coeff -1.51, p value 0.01%). The results can be interpreted as follows. Audit effort in audit hours is interpreted as a form of audit (business) risk by investors. Thus, investors are less (more) likely to speculate in firms with high (low) audit effort, which

influences stock price volatility. All independent variables are statistically significant and show the expected results and are consistent with univariate and correlation testing. Taken together, the results allow us to accept our hypothesis.

<Insert Table 3 here>

V. Additional analysis

5.1. Audit fees and size effect

DeFond and Zhang (2014) surmise that a limitation of the audit effort literature is that audit quality assertions are provided in studies that include only a single audit effort input in empirical models. This assertion is exemplified by mixed results capturing the effect of audit effort on stock price volatility (see Clinch et al., 2012; Godbey and Mahar, 2004; Jin and Myers, 2006; Jorjani and Safari Gerayeli, 2018; Morck et al., 2000). Therefore, to provide clarity regarding how audit effort (fee/hour) can be interpreted differently by market participants, we interpret the association between audit fees (hours) and stock price volatility. Previous Korean studies demonstrate that clients secure audit hours for signalling/legitimacy purposes, only if audit hours do not increase at a higher rate compared to audit fees (Lim and Mali, 2020; Mali and Lim, 2020, 2021). In Table 4, (column 2 and 4), a strong negative association is demonstrated between audit hours and SPV when the *size* variable is included (Coeff -3.54, p value 0.01%) and excluded (Coeff -6.84, p value 0.01%). The results imply (Table 3) model robustness.

In column 1, the natural logarithm of audit hours are replaced with the natural logarithm of audit fees. Audit fees are negatively associated with stock price volatility, when *size* is not included in the regression (Coeff -1.51, p value 0.01%). However, in column 3, the directional relationship between audit fees and stock price volatility

changes from being negative to marginally positive with the inclusion of *size* variable (Coeff 0.79, p value 0.05%). The results suggest that audit fees are highly dependent on firm size, consistent with the assertion that large firms have higher audit risk, based on complex business systems (Cheung and Ng, 1992; Langendijk, 1997; Peel and Roberts, 2003; Van der Laan and Christodoulou, 2012).

The results can be interpreted as follows. Audit supply theory infers audit fees represent the incentive of audit firms to demand a fee premium to reduce business risk and reputational damage. Thus, as audit fees increase, investor confidence (speculation) decreases (increases) based on the perception that audit fees can be a signal of audit risk. The results support the assertion that audit fees are likely a better proxy for audit risk, and audit hours are a felicitous proxy for audit effort. Furthermore, the results imply that in a country such as South Korea, where audit failures have caused large scale financial crises, market participants are nuanced in making investment decisions, based on audit hours/effort and fee/risk assertions.

<Insert Table 4 here>

5.2. Audit fee per hour

Because the relationship between audit fees and audit hours are different, next we determine whether audit fee per hour influences stock price volatility. As suggested by Camrean et al. (2018) audit fees per hour can be interpreted as audit efficiency, with high (low) audit efficiency being associated with robust (weak) systems and low (high) audit fees, based on junior (senior) auditors conducting audits based on technical requirements. Therefore, to add robustness, we use audit fee per hour as an additional audit risk proxy. In Table 5, a negative relationship between stock price volatility and

audit fees per hour is reported (coeff -0.00; t value, 4.62). The results can be interpreted as follows. Audit hours at a discounted fee can be considered as enhancing investor confidence in financial reporting quality, reducing investor speculation. On the other hand, as the fee premium demanded by audit firms increases, it can be considered a signal of audit risk, that reduces (increases) investor confidence speculation.

<Insert Table 5 here>

5.3. Controlling for audit fee premium

Next, we borrow from Mali and Lim (2023) to demonstrate the association between SPV and audit hours, after controlling for the audit fee premium effect. They develop a model where in the first regression (model 2), the compensation that audit firms would expect to mitigate litigation risk and reputational damage is derived. The first regression lists audit fees as the dependent variable. Independent variables are established measures of audit risk/fees [1]. The residual from model (2) therefore represents the audit fee premium (Billing rate) demanded by audit firms, based on client audit risk. We report untabulated results that all audit risk variables show the expected association with audit fees. The model's VIF is 1.04, implying the model does not suffer a multicollinearity problem.

[1] Size: (Natural logarithm of total assets), Lev (Total liabilities to total assets ratio), Loss (A dummy variable that is 1 if previous net income is negative, 0 otherwise), Current_r (the ratio of current assets to current liabilities ratio), ROA (net income divided by total assets), Big4 (A dummy variable that takes 1 if an auditing firm is Big4 auditor, 0 otherwise), TRM (Aggregated real earnings management measure based on Cohen and Zarowin, 2010), AEM (Performance adjusted discretionary accruals based on Kothari et al., 2005), Interest Coverage (Operating income to interest expense) and industry and year fixed effects.

$$Audit\_Fee_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Lev_{i,t} + \beta_3 Loss_{i,t} + \beta_4 Current_{R\,i,t} + \beta_5 ROA_{i,t} + \beta_6 BIG4_{i,t} + \beta_7 TRM_{i,t} + \beta_8 AEM_{i,t} + \beta_9 Interest\_Coverage_{i,t} + ID + YD + \varepsilon_{i,t} \quad (2)$$

$$SPV_{i,t} = \beta_0 + \beta_1 Audit\_Effort_{i,t} + \beta_2 Size_{i,t} + \beta_3 Investment_{i,t} + \beta_4 TobinQ_{i,t} + \beta_5 Age_{i,t} + \beta_6 Lev_{i,t} + \beta_7 Loss_{i,t} + \beta_8 ROA_{i,t} + \beta_9 Bigown_{i,t} + \beta_{10} Fee\_premium_{i,t} + YD + ID + \varepsilon_{i,t} \quad (3)$$

In the second stage regression, model (3), the effect of firm managerial remuneration on audit fee is determined after controlling for fee premium effect. Table 6 reports the results for model (3). After controlling for the audit fee premium effect, we continue to find that the association between audit hours and stock price volatility is negative (Coeff -1.52, t value -8.33). Taken together, the results provide further evidence in support of the main analysis.

<Insert Table 6 here>

5.4 Big4/NonBig4 analysis

It is established in the literature that the audit quality of Big4 audit firms is higher compared to NonBig4 auditors (Chen et al., 2005; DeAngelo, 1981; Basu et al., 2001; Feldman et al., 2009). Thus, we interpret that increasing levels of audit effort secured by Big4 audit firms/clients can be perceived differently by market participants. In Table 7, Panel A, the full sample is divided into Big4 and NonBig4 audit firm/clients. For both samples, as expected, results show that audit hours have a negative effect on stock price volatility (Big4, coeff; -1.47 t-value -6.08, and NonBig4, coeff; -1.76 t-value -7.25).

<Insert Table 7 here>

In panel B, to compare the incremental effect of audit hours on stock price volatility for Big4/NonBig4 clients/firms, a dummy variable is introduced. The value of 1 represents Big4 audit firms/clients, the value of 0 represents NonBig4 audit firms/clients. The interaction term *Audit_Effort* Big4* captures the relative effect of Big4 audit hours on SPV. *Audit_Effort* Big4* is significantly negatively associated with stock price volatility (Coeff -1.38, p value 0.01%). The results show that clients that are audited by Big4 auditors for longer periods (hour) have lower stock price volatility, relative to NonBig4 firms/clients. We interpret the results as follows. In the main analysis, investors perceive that increasing audit hours enhance audit quality, hence investor confidence. However, an increase in the audit hours exerted by Big4 auditors improves audit quality to a greater extent compared to Non-Big4 auditors. Thus, investors are likely to have a lower propensity to invest/divest in Big4 clients, as audit hours increase.

5.5 Endogeneity tests 2SLS and GMM

Next, two stage least square regression analysis is considered a robust test for endogeneity. In the first stage regression (equation 4), Audit_Effort in period t minus one is considered a robust instrument, as inferred in previous studies (Caramanis and Lennox, 2008; Han et al., 2023). All other control variables remain constant and equivalent to equation (1). Table 8 Panel A shows, as expected, $\text{Audit\_Effort}_{i,t}$ is positively influenced by $\text{Audit\_Effort}_{i,t-1}$(Coeff 0.44, t value 67.34).

Model: 1st stage

$$\text{Audit\_Effort}_{i,t} = \beta_0 + \beta_1 \text{Audit\_Effort}_{i,t-1} + \beta_2 \text{Size}_{i,t} + \beta_3 \text{Lev}_{i,t} + \beta_4 \text{Big4}_{i,t} + \beta_5 \text{Big\_Own}_{i,t} + \beta_6 \text{Foreign}_{i,t} + \beta_7 \text{Age}_{i,t} + \beta_8 \text{ROA}_{i,t} + \beta_9 \text{Loss}_{i,t} + \text{ID} + \text{YD} + \varepsilon_{i,t} \quad (4)$$

Model: 2nd stage

$$SPV_{i,t} = \beta_1 \text{Audit\_Effort}_{i,t} + \beta_2 \text{Size}_{i,t} + \beta_3 \text{Lev}_{i,t} + \beta_4 \text{Big4}_{i,t} + \beta_5 \text{Big\_Own}_{i,t} + \beta_6 \text{Foreign}_{i,t} + \beta_7 \text{Age}_{i,t} + \beta_8 \text{ROA}_{i,t} + \beta_9 \text{Loss}_{i,t} + \text{ID} + \text{YD} + \varepsilon_{i,t} \quad (5)$$

After deriving a value of $\text{Audit\_Effort}_{i,t}$ in equation (4), the predicted value is included as an independent variable in equation (5), as an additional control. When the predicted $\text{Audit\_Effort}_{i,t}$ value is included into equation 5, the results remain qualitatively indifferent to the main analysis (Coeff 0.77, t value 2.79). Next, Durbin and Wu-Hausman tests are conducted where the null hypothesis infers that $\text{Audit\_Effort}_{i,t}$ is exogenous. The insignificant Wooldridge score provides evidence the model is free from endogeneity (Durbin Chi2, 0.0006: p, 0.98 and Wu-Hausman, 0.0006: p, 0.97). Using equations (4) and (5), an equivalent methodology was followed using the GMM procedure. For brevity, untabulated results are reported. Again, empirical results are qualitatively indifferent to the main analysis ($\text{Audit\_Effort}_{i,t}$ Coeff 0.77, t value 2.76). Likewise, the GMM (C statistic Chi2) test of endogeneity provides evidence that the model does not suffer from an endogeneity issue (Chi2, 0.0005: p, 0.98).

<Insert Table 8 here>

5.6. Alternate risk proxy

Stock price movements can be estimated using two measurements, i) stock price volatility (dependent variable) or ii) market beta. As an additional analysis, we replace

stock price volatility with beta and repeat our analyses. We report untabulated results that all analyses conducted using market beta and stock price volatility are in all aspects equivalent. This result is expected because both stock price volatility and beta are equivalent estimates.

5.7. Controlling for the financial crisis and earnings management and fixed effects

To add further robustness, all the aforementioned analyses are repeated after controlling for fixed/industry effects using; the Fama Macbeth (1973) procedure, and after controlling for industry/year clustered errors. We report untabulated findings that all results remain qualitatively indifferent. A dummy variable is also added where a value of 1 represents the year 2008 to control for the financial crisis period, 0 otherwise. Untabulated results (Coeff -0,01: t value -22.09) infer that during the financial crises, the effect of audit hours on stock price volatility is lower than in other periods. An analysis is also conducted where real earnings management (Cohen and Zarowin, 2010) and accruals earnings management (Kothari et al., 2005) are included as an additional control. Untabulated results provide evidence that i) results remain qualitatively indifferent and ii), accruals earnings management and real earnings management are shown to increase with audit effort, consistent with previous studies.

VI. Conclusion and discussion

This study has several important implications. First, DeFond and Zhang (2014) provide a comprehensive review of the audit effort/quality literature. They explain that the association between audit effort and stock price volatility is mixed (positive, Gul et al., 2010; Su et al., 2016 / negative, Clinch et al, 2012; Jorjani and Safari Gerayeli, 2018;

Godbey and Mahar, 2004), because various audit effort proxies are utilized to make audit quality assertions (audit tenure, Big4/NonBig4, fees and hours) in individual studies. They also assert that whilst audit hours information is rare, it is a well-designed measure of audit effort/quality, because audit hours represent the levels of substantive and control tests conducted by audit firms. South Korea is a rare instance where audit hour information is reported on Annual Reports. Empirical results using Korean data show that in an instance where audit hours are publicly disclosed, as audit hours increase, stock price volatility decreases. Thus, this study infers that based on investor confidence, increasing (decreasing) audit hours decrease (increase) disinvestment / investment speculation. To the best of our knowledge, this is the first study to demonstrate that the public disclosure of unique audit hour information can influence the decision-making process of (potential) investors. The results support the assertions made by (Kueppers et al., 2021), who state the value added by audit quality influences the decisions of investors.

Second, stock price volatility destabilises a firm's capital structure and negatively effects business planning. The study therefore has implications for management and business strategy. Investors use all available forms of information for decision making purposes (Jensen and Meckling, 1976). Empirical results from this study infer that i) clients with high audit hours/effort have high investor confidence. ii) Clients with low audit hours/effort have low investor confidence. Whilst no accounting/audit legislation exists to mandate clients report audit hours on Annual Reports, we surmise that management that adopt such a strategy can influence shareholder perceptions, hence potentially reduce stock price volatility, which will have capital planning benefits. The above assertion is supported by audit demand theory studies that show management that

demand high levels of audit effort can been seen as adopting a robust business strategy to enhance business controls (Carrington, 2010; Kim et al., 2012; DeFond and Zhang, 2014), and agency theory studies that show that shareholders demand audit effort to reduce information asymmetry (Esplin et al., 2018; Lobo and Zhao, 2013; Watts and Zimmerman, 1983).

Third, following Simunic's (1980) seminal study, audit effort is divided into i) audit hours, ii) fees, and iii) the premium required by audit firms. However, due to data unavailability, the literature is dominated by the audit risk/fee (supply theory) perspective. Limitations of audit fee/risk interpretations are exemplified by studies that demonstrate that audit fees can represent a client's demand for enhanced financial reporting quality, as well as audit risk (Hay, 2008, 2013; Gul and Goodwin, 2010; Jallow et al., 2012; Li et al., 2020). To extend the literature, audit fee and fee per hour interpretations are provided to disentangle audit demand/supply theory assertions. Consistent with an audit supply theory assertion, audit fees are shown to increase stock price volatility, implying higher audit fees are a signal of audit risk, that increases (decreases) investor speculation (confidence). However, as audit fees per hour decrease (increase), stock price volatility decreases (increase). Taken together with the main analysis, the results suggest that audit hours only decrease stock price volatility, if no fee premium is attached. This assertion is consistent with Korean studies, that show low audit fees (per hour) indicate a balanced audit team can conduct an audit (including junior staff member), due to its low audit risk (Lim and Mali, 2020; Mali and Lim, 2020, 2021). High audit fees (per hour) are a signal partners/specialists are required to participate in an audit, due to a perception of inherently high audit risk. To extend the limited audit demand/hour theory literature, we would encourage future studies to make

i) audit hour, ii) fee, and iii) fee premium assertions, consistent with DeFond and Zhang's (2014) suggestion.

Fourth, it is accepted that the audit quality of Big4 audit firms is higher compared to Non-Big4 auditors (Basu et al., 2001; Chen et al., 2005; DeAngelo, 1981; Feldman et al., 2009; Fukukawa and Kim, 2017). However, conflicting evidence exists in the extant literature regarding the association between Big4/NonBig4 audit effort and stock price volatility. Gul et al. (2010) report that Big4 audit effort increases stock price volatility based on Non-Big4/Big4 switch. Clinch et al. (2012) report Big4 audit effort (firm selection) reduces stock price volatility. This study extends the literature by demonstrating that based on Big4/NonBig4 selection alone, the stock price volatility of Big4/NonBig4 clients are not statistically significantly different. However, empirical results show that as a Big4 auditor imparts increasing levels of audit hours, compared to a NonBig4 auditor, the stock price volatility of NonBig4 clients decrease. The results support the assertion investors can be nuanced when making investment decisions, based on Big4/NonBig4 audit effort. This results therefore extends the Big4/NonBig4 audit literature.

Fifth, a normative perspective is provided. Thus far, we suggest that management should be pro-active in disclosing audit hour information, because it is likely to influence investor confidence and reduce stock price volatility. However, it can also be argued that not reporting audit hour information on a transparent basis is a legislative oversight. If a client is in financial difficulty, audit hour information would be useful to market participants to make hour/fee/fee per hour assertions. However, this information is only available in most countries *ex post*. Low levels of audit hours are shown to increase time-pressure on audits, as well as reduce audit quality (Ettredge, et al., 2014; Guénin-Paracini, 2014; Lambert et al., 2017). Furthermore, countless high

profile financial collapses have led to employees losing their jobs and pension. Therefore, given that there is an increasing trend for firms to promote sustainability practices, we would encourage firms to disclose audit hours information on Annual Reports as a corporate social responsibility strategy. Fraser (2010) explains that there are many obstacles to global audit policy conference. However, given the practice already exists in South Korea, we encourage international legislators to consider mandating firms adopt the Client Engagement Policy, implemented from 2001.

Finally, limitations are discussed. This study takes a long-term approach to capture the effect of audit effort on stock price volatility over a fiscal year. We do not capture the short-term effect of audit hour information on stock price volatility on Annual Reports (on a case study basis), because audit hour information can be disclosed on an inconsistent basis (Website/Twitter/Newsletter). We leave it to future studies to capture whether the publication of audit hours via unstructured disclosures or via Annual Reports has a short-term (daily) impact on stock price volatility. Furthermore, whilst previous studies report that audit tenure/switch can influence stock price volatility (Su et al., 2016; Jorjani and Safari Gerayeli, 2018), we do not include these variables because South Korea has implemented numerous audit firm rotation policies which is likely to introduce bias into the model (see Choi et al., 2017). Moreover, the reason why clients can secure audit hours to signal audit quality is because price competition in South Korea has led to cheap audit fees (Kwon et al., 2014; Park and Lee, 2008). Thus, from the perspective of investors, a firm with high audit fee and low audit hours may considered innately risker firm in terms of audit risk in a Korean setting. To generalize our findings, we encourage future studies to replicate this analysis in other markets where audit hour information is publicly disclosed.

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