ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis

Impact of audit quality on firm performance

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August 9, 2018

ABSTRACT

Increased importance of the audited financial statements is continuously given by investors and shareholders. Audited statements are considered essential for reducing information asymmetries between parties and assuring market efficiency and credibility. Whether the audit improves the performance of firms is a widely investigated topic. Expectations are that in presence of credibility and reliability of audited financial reports the financial performance of the firms is improved. In presence of information asymmetry this may not be the case. This paper aims to investigate the impact of audit quality on firm performance. The focus is on 2051 North-American listed corporations on a time span from 2001-2018. A two-step approach is followed in order to estimate the impact. The first stage estimates audit quality as the residuals of a regression of audit fees on size, risk, complexity of the firms, as well as a dummy variable of auditor size. The second regression estimates the effect of the audit quality, book value per share, earnings per share, dividends per share and dividend yield on stock prices. The rationale behind this approach is that audit quality is not measurable, but it surely affects the price of the audit in a positive way. As such, it is part of the error term in a regression that explains audit fees, which is how it is estimated. The residuals from the first regression are the proxy for Audit Quality, and will be used in the second regression as one of the explanatory variables. The results indicate that audit quality has a significant and positive effect on firm performance as measured by stock prices. In addition, there is evidence that book value per share and earnings per share also have a significant and positive effect on stock prices, as expected. However, dividends per share and dividend yield are not significant determinants of stock prices.

1. INTRODUCTION

In a world of emerging markets, scandals going public more than ever due to the active role of the media and increased importance of corporate governance, auditing plays a significant role in capital markets. Through the independent and systematic assessment of accounts, books and statutory records, auditing firms report whether the financial statements and also non-financial disclosures present a true and fair view in accordance with accounting rules. As such, financial statements are considered vital to make profitable investment decisions, and investors rely on the transparency of the disclosed information and their credibility affects the confidence they have on stock performance. Increased trading volume and improved stock prices reflect investors' optimistic behavior towards the firm. To eliminate ambiguities and uncertainties, auditors serve as a medium of interaction between companies and shareholders or investors.

Audited firms increase the confidence of investors, brokerage firms and dealers, as compared to non-audited firms. Due to this increased confidence based on the trustworthiness of information, there is a growth in the demand for the stock as well as its trading volume. This has a significant influence on stock prices (Hussaynei, 2009). The argument in favour is that companies that have focused on the quality of audit, experience positive trends in their stock prices, while those being audited by low quality firms may face negative reactions. Francis (2004) argues that outright audit failures are very rare, less than 1% annually, and this provides proof about an acceptable level of audit quality. Thus, this increases the public confidence in audit quality.

Audit quality influences investors' opinion and as a result their behavior towards the company stock. This is reflected in the fluctuations in stock prices. Thus, audit quality is expected to have a significant impact on stock prices of firms. Ghosh and Moon (2005) argued that audit opinions and audit reports are considered by investors as trustworthy financial sources. They consider audited information more reliable than unaudited information and their confidence about company's stock increases.

Auditors influence the information quality through monitoring process that reduces noise and bias (Watkins, Hillson and Morecroft, 2004). The results of the monitoring efforts of auditors are used to identify risks and to decrease the duration and frequency of auditing. The information provided by auditor monitoring minimizes the difference between the client's reported economic state and the unobservable or realistic economic circumstances. Auditor

independence reflects the effectiveness of an auditor's monitoring in terms of his/her competence and objectivity.

Based on the above, causality may exist between the quality of auditing firms and the performance of audited firms. The purpose of this paper is to assess the impact of audit quality on firm performance of North-American corporations. In order to achieve that, the following main research question should be answered:

Does audit quality affect the performance of the North American listed firms from 2001-2018?

The accounting regulator is calling on firms to improve their services and the quality of the auditing process. In order to provide feasible answer to the above research question, some other research questions arise. How is firm performance measured? Firm performance can be proxied in several ways. Mehran (1995) measured it by stock prices. Some other authors, such as Fu, Singhal and Parkash (2016) measured it based on Tobin's q ratio.

Another research question is "How can audit quality be measured?" Audit quality is not a concept that can be easily measured. Different authors, such as Francis and Michael (2009), have used dummies of Big Four or Big Eight as proxies of audit quality; others such as Sayyaer, Rohaida and Sidi Zaleha Abdul-Elhabib (2015) have used audit fees themselves and audit rotation as proxy for audit quality. Nonetheless, quality is an abstract concept and as such it is unmeasurable. Audit fees themselves are subject to various characteristics of the auditor and auditee. For this reason, any regression explaining auditing fees will have audit quality in the error term. Hence, the approach proposed in this paper is to use the residuals of a regression explaining audit fees on a set of independent variables as a proxy for audit quality.

Based on these arguments, this paper uses a two-step approach. The first step estimates a regression of auditing fees and saves the residuals that will be used in the second step to estimate firm performance on audit quality and a set of control variables. The sample consists of 2051 corporations listed in the American stock exchange in a time span from December 2000 until December 2017.

The rest of the paper is structured as follows: Section 2 will provide a discussion of the relevant literature, focusing on the determinants of audit fees and the determinants of stock prices. In Section 3 and in Section 4, Data and Methodology will be introduced. Results of the research will be reported in Section 5 and Section 6 concludes.

2. LITERATURE REVIEW

The importance of the auditing quality has inspired many researchers to analyze the impact auditors have on firm performance as well as the credibility of the audit statements in the eye of investors. Datar, Feltham and Hughes (1991) discussed in their paper the value of audited reports to entrepreneurs that have private information and want to share the diversifiable risk among investors. According to them, audit value to investors increases proportionally with audit quality and the firm specific risk entrepreneurs encounter.

Given that in this research a two-step approach will be used, the same approach is followed in this section. The auxiliary regression in this research will estimate audit quality, which will be drawn as the residuals of the regression of audit fees on a set of explanatory variables. The rationale behind is that quality is an abstract concept and cannot be measured. As such, it will always remain in the error term of the audit fee regression. The second stage will explain firm performance based on a set of independent variables, including audit quality.

2.1. The determinants of Audit Fees

Chan, Ezzamel and Gwilliam (1993) discussed in their paper the determinants of audit fees for quoted UK companies. They aim to explain the variation in audit fees paid by companies using data from 1987 until 1988 for 985 quoted companies. The cross-sectional regression they use estimates the effects that Auditee Size, Auditee Complexity, Auditee Risk, Auditee Profitability, Ownership Control, Timing variables, Auditor Location and Auditor Size, have on Audit Fees. Auditee Size is measured based on Total Assets of the firms. They argue that this is the most suitable measure when audit firms follow a balance-sheet-based audit approach, otherwise Turnover is found to be a better explanatory variable. They argue that Auditee Complexity could be measured either by the Number of Subsidiaries, Number of Employees or Accounts Receivable to Total Assets ratio. The required audit efforts are expected to increase with the increase in the complexity of the task and this is likely to cause audit fees to increase. The nature of the business and the environment in which it operates is reflected in the Auditee Risk. The authors measure Auditee Risk based on financial risk measures of balance sheet, namely Liquidity Ratios. One would expect high audit risk to result in a higher audit fee, caused by more audit testing requirements or as an "insurance premium". Auditee Profitability is proxied by the Return on Shareholder's Equity. With regards to Ownership Control, Chan, Ezzamel and Gwilliam (1993) they employed a wide proxy that includes directors beneficial

and non-beneficial shareholdings and all disclosed shareholdings. The Time Variable included in the study is the number of weeks between the end of the client's financial year and the date of the audit report. Auditor Location is a dummy variable that takes a unit value if the audit is carried out by a London office and 0 otherwise. Auditor Size is a dummy variable that takes the unit value if the firm is audited by one of the Big Eight accounting firms (Arthur Andersen, Coopers and Lybrand, Deloitte Haskins and Sells, Ernst and Whinney, Peat Marwick Mitchell, Price Waterhouse, Touche Ross, Arthur Young) and 0 otherwise. The study concludes that the variables that have a significant influence in Audit Fees are Auditee Profitability, Ownership Control, Audit Location, Auditee Size and Auditee Complexity. In addition, the results show that when Turnover is used as a proxy for Size, no significance is found, whereas when Total Assets are used, Size has a significant impact on Audit fees.

Pong and Whittington (1994) estimated a model of audit fee determination based upon Size, Characteristics of Auditor and Auditee, and whether there has been a change of Auditor. In addition, they argue that the effect of the auditee size depends on complexity and vice versa, hence they add an interaction term between Total Assets and Complexity in the model. The database consists of 577 listed UK companies for the years 1981 until 1988. Size is measured by two proxies, Total Assets and Sales. Size is allowed to have a quadratic relationship with Audit Fees. Another determinant is Complexity. This is measured by the Number of Subsidiaries. The results show that both Size Variables, Sales and Assets, have a significant quadratic effect. Their relationship with Audit Fees indicates economies of (auditee) scale in auditing. They conclude that Auditee Size is one of the most important factors. The Complexity variable has a significant positive coefficient. The coefficient of the interaction variable is positive and significant indicating that a higher complexity results in higher audit fees, and this effect is higher for larger firms. The Big Eight variable has a large positive coefficient, indicating that a Big Eight auditor charges more than a non-Big Eight auditor. The Change of Auditor shows evidence of low-balling. The coefficient on the change of auditor variable has a negative sign, indicating that auditors in their first year charge significantly less than other auditors.

Ani and Mohammed (2015) analyzed the effect of audit quality on firm performance (financial and marketing) in three sectors: industrial, service and finance in Oman, Middle East. The study consists of 112 listed companies on the Muscat Securities Market from 2009 until 2013. Audit quality in this paper is measured by Big Four or non-Big Four accounting firms (Deloitte and Touche, PricewaterhouseCoopers, Ernst & Young, KPMG). For measuring firm

performance, they look into profitability and market performance. Profitability is proxied by Return on Assets (ROA) and Return on Equity (ROE). The proxy for market performance is Market Fair Value of Shares (MFV) and the proxy for risk is Leverage (L). The results of the paper show positive correlation between Big or Non-Big Four, Return on Equity and Market Fair Value. Looking at specific industries, MANOVA test indicates significant effect of Big Four indicator on only Market Fair Value. In the industrial sector, Big Four indicator has a significant effect on Return on Equity and in the finance sector it has a significant impact on Market Fair Value.

The paper by Kusharyanti (2013) analyzes certain factors that potentially have an impact in audit fees. These factors are Client Size, Audit Complexity, Audit Risk, Big Four, Financial Condition, Auditor Tenure, Committee Characteristics and Audit Specialization. They measure Client Size by Total Assets of the firm. For measuring Audit Complexity, the number of employees working in the firm is used and Audit Risk is measured by Total Debt to Total Equity ratio. The research is focused on 60 companies listed on the Indonesian Stock Exchange in the time frame 2000-2011. To test the significance of the variables, an OLS regression is used, with dependent variable Audit Fee, thus ignoring the time dimension of the data. The results indicate that the significant variables are Client Size, Audit Complexity and Audit Risk.

Karim and Moizer (1996) analyzed the determinants of audit fee for financial and non-financial companies in Bangladesh. The sample included in the analysis consists of 121 listed companies in the Dhaka Stock Exchange from 1991 until 1992 and 36 unlisted, 17 of the latter were government owned. The explanatory variables are Auditee Size, Auditee Complexity, Auditee Risk, Auditee Profitability, Government Ownership, Auditor Size, Employment of Qualified Accountants, Active Trading, Multinationalism and Financial or non-Financial company. Auditee Size is measured by Total Assets. To measure Complexity, they argue that several variables can be used, such as Number of Branches, Number of Subsidiaries, Location of Subsidiaries, Number of Industries in which the client operates Ratio of Inventory to Total Assets and ratio of Receivables to Total Assets. Due to limitations they decide that the most suitable measure is the proportion of assets in the form of inventory and receivables. Auditee Risk is defined as the ratio of total debt to total equity. Auditee Profitability is measured by the ratio of Net Profit to Sales. Government Ownership shows the percentage of the company that is owned by the government. The results from the regression indicate that Auditee Size, measured by Total Assets, has the greatest effect on audit fees. In addition, financial service companies were found to have higher fees as compared to non-financial service companies.

With regards to Multinationalism, subsidiaries of multinational companies had higher audit fees.

From this section, it is concluded that the empirical determinants of audit fees are the variables listed in *Table 1.1*.

Table 1.1: Significant variables found in literature review

	Chan, Ezzamel & Gwilliam (1993)	Pong and Whittington (1994)	Ani and Mohammed (2015)	Kusharyanti (2013)	Karim and Moizer (1996)
Auditee Size	+	+		+	+
Auditee Complexity	+	+		+	
Auditee Risk				+	+
Auditee Profitability	+				
Ownership control	+				
Audit location	+				
Auditor Size		+	+	+	
Change of auditor		+			
Financial Service					+
Multinationalism					+

Whether these variables can be used or not in our analysis depends on the data availability which is explained in Section 3.

The main hypothesis in this research is:

Ho: *Audit quality has no effect on firm performance*

Ha: *Audit quality has a positive effect on firm performance*

In order to test this hypothesis, the following section presents a literature review on the determinants of firm performance. The aim of the review is to identify the measures of firm performance and the set of explanatory variables that will be used as control variables in order to get consistent estimates of audit quality.

2.2: Determinants of firm performance

Tandon and Malhotra (2013) studied in their paper the potential determinants of stock prices. Their research is focused on 95 companies listed on the National Stock Exchange (NSE) from 2007 until 2012. The variables that are included in the analysis are Book Value per Share,

Dividend per Share, Earnings Per Share, Dividend Cover, Dividend Yield and Price Earnings ratio. Book value, also called net assets value per share, shows the net investments per share made by the shareholder in the business. Dividend is the part of profit after tax that is distributed to shareholders. Dividends per share show how much the company paid out as dividends. Earnings per share is the ratio of the profit after tax of the company after having

paid out the preferred dividends. Dividend yield shows how much dividends the company pays out per year relative to its share prices. The results of the paper indicate that Book Value per Share, Earnings per Share, Dividend per Share have a positive significant impact on stock prices while Dividend Yield has a negative significant impact on stock prices.

Mehr-un-Nisa and Nishat (2011) examined in their research the determinants of stock prices in Pakistan. Their study is focused on 221 firms listed on Karachi Stock Exchange from 1995 until 2006. The set of variables are of two types: Company Fundamentals and Macroeconomic Indicators. The variables included in their study are previous year's Stock Price, Liquidity Ratio, Capital Structure, Market to Book value, Dividend Payout Ratio, previous year's Earnings Per Share, Size of firm, Share Turnover Ratio, GDP growth, Inflation Rate, Interest Rate, Money Supply, Size of Stock Market, Financial Depth and a Time dummy variable accounting for the impact of corporate reforms in 2002. Results of the paper indicate that previous year's Stock Prices have a strong association with the Stock Prices in the current year. Moreover, Company Size and Earnings per Share from previous year are the most important variables in the determination of stock prices. From the set of macroeconomic indicators, real GDP growth, rate of interest and financial development have a significant impact on stock prices.

Dechow (1993) investigated the circumstances under which accruals improve earnings' ability to measure firm performance, which is reflected on stock prices. Stock prices are perceived as incorporating the information in realized cash flows and earnings concerning firm performance. The researcher examines three measurement intervals, quarterly, yearly and four-yearly. The dataset consists of firms listed on the New York Stock Exchange or American Stock Exchange from 1980 until 1989. The sample includes 19,733 firm-quarter observations, 27,308 firm-year observations and 5,175 firm-four-year observations. In order to test the hypothesis raised in the paper, pooled OLS regressions are used. Firstly, the researcher tests the effect of aggregate accruals on the ability of earnings and cash flow to measure the performance of firms. The results are consistent with the prediction that accounting accruals are a good measure of short-term firm performance.

Bharadwaj (2000) empirically studied the relation between IT capabilities and firm performance. IT recourses for each firm are organized as IT infrastructure, human IT resources, and IT-enabled intangibles. IT infrastructure is a shared information delivery base, defining the business functionality. Human IT recourses comprise the technical IT skills, such as programming and system analysis and the managerial IT skills such as the effective

management functions, coordination and communication, and leadership skills. IT-enabled intangibles include key organizational intangibles such as know-how, corporate culture, corporate reputation and environmental orientation. The researcher uses a matched sample comparison group methodology in order to empirically assess the association of IT capabilities and firm performance. The results provide empirical support for the relationship between superior IT capabilities and the performance of firms.

From this review we can conclude that the set of variables used by various authors is very different, thus the set of explanatory variables that we will use will be decided depending on data availability, discussed in Section 3. This paper contributes to the current research in a number of ways. Firstly, it uses a unique approach in the measurement of audit quality. Secondly and consequently, a different methodology is used as compared to previous research done on the topic.

3. DATA

The dataset used in this research is retrieved from Wharton Research Data Service (WRDS). The data for the audit fee regression are downloaded from Audit Analytics and the data for the firm performance regression from Compustat North America. The data selected comprise of both cross-sectional and time series elements. This type of dataset is called longitudinal data or panel data. The combination of cross-sectional and time series data that panel data offers, increases the number of observations, consequently it increases the degrees of freedom, thus providing higher power of the tests.

As the Audit Fee variable is measured on a yearly basis, the other variables are retracted in yearly terms. The Audit Analytics data provides information for all companies worldwide, thus it is filtered so that information for North American firms is given. On Compustat dataset, those companies with an inactive status are removed and companies with a blank Ticker, meaning not listed on stock exchange, are also cleared from the dataset.

The final dataset consists of 2051 cross-sectional data (N=2051) with 18 time periods, from 2001 until 2018. This panel dataset is unbalanced, because some of the firms lack observations in certain years. However, due to the large amount of observations and no patterns in the missing observations, the dataset is considered appropriate for the analysis.

As discussed in Subsection 2.1, common variables found to have a significant impact on audit fees based on previous research, are Auditee Size, Audit Complexity, Audit Risk and Big Four Dummy. Kusharyanti (2013) measures size by Total Assets, Chan, Ezzamel and Gwilliam (1993) measures complexity based on the Number of Employees in the firm. Audit risk is measured by the ratio of total debt to total equity (Kusharyanti, 2013). A high debt to equity ratio would generally mean that the company has been aggressively financing its growth with borrowed money, thus signaling a high risk. Big Four is a dummy variable that takes a unit value for one of the Big Four accounting firms, Deloitte Touche, PricewaterhouseCoopers, Ernst & Young, Klynveld Peat Marwick Goerdeler, and 0 otherwise.

Below a summary table of the variables used and their measurement is presented:

Table 1.2: Audit Fee determinants and their measurement

Client Size	Audit Complexity	Client Risk	Big Four Dummy
Total Assets	Number of Employees	$\frac{Total\ Debt}{Total\ Equity}$	1: Big Four 0: Otherwise

In the second step, the dependent variable is firm performance. Based on the data availability, this is measured by stock prices. With regards to the explanatory variables, the residuals from the first stage regression will be used to proxy for audit quality. The control variables will be similar to those used in the paper of Tandon and Malhotra (2013) which was discussed in section 2.2, because WRDS allows the extraction of these variables.

Table 1.3 summarizes the set of explanatory variables (except for audit quality) and their measurement.

Table 1.3: Stock Price determinants

Book Value	$\frac{Common\ Equity}{Number\ of\ shares\ outstanding}$
Dividends per share	$\frac{Dividends}{Number\ of\ shares\ outstanding}$
Earnings per share	$\frac{(Net\ profit\ after\ tax - Preferred\ dividends}{Number\ of\ shares\ outstanding}$
Dividend Yield	$\frac{DPS\ x\ 100}{Market\ Price}$, where $Market\ Price = \frac{High\ Price + Low\ Price}{2}$

In order to have deeper knowledge about the data, descriptive statistics are shown for the variables that will be used in the analysis. Table 1.4 shows the overall statistics of the variables used in the first regression model.

Table 1.4. Descriptive statistics of the variables to be used in the first stage regression

Variables	Obs firm-years	Mean	Std. Dev.	Min	Max
Audit fees	9,271	1,615,581	4,673,860	0	81,400,000
Size	9,271	25,892.98	145,779.4	0	3,001,251
Risk	9,271	.6491304	3.512957	-47.32668	49.5717
Complexity	9,271	23.85243	68.63166	0	2,100
Big Four	9,271	.7835185	.4118684	0	1

In the table above, the number of observations shows the number of firm-years observations which is the size of the sample and the mean shows the center of the data. Audit fees is measured in dollars. Size is measured in million-dollar units, Complexity is measured in thousands and Risk is a ratio. Big four is a dichotomic variable taking only values 0 or 1. The variable with the highest mean is the Audit Fee variable. The standard deviation is used to determine how spread out the data is from their mean. A high value of standard deviation shows a great spread of the data. Risk, calculated as the ratio of Total Debt to Total Equity, can take negative values. Although debt itself cannot be negative, a negative total equity indicates that the company is taking losses. A negative ratio of Debt to Equity shows that the company necessitates an increase in the equity from its shareholders.

The mean of Audit Fee is about US$ 1.6 million, with a high standard deviation of 4.7 million. The average size of listed firms, measured by Total Assets, is approximately 26,000. For listed firms, Risk has an average of 0.65 and its highly variable with a minimum value of -47 and a maximum of about 50. Complexity as measured by the number of employees has a mean value of approximately 24,000 and a standard deviation of 69,000 employees. In terms of employees, the smallest firm has 0 employees. This variable represents the average number of employees for some firms and the number of employees at year-end for some other firms. It may be possible that some firms were no longer listed on stock exchange or have gone bankrupt, thus the year-end report contains no employees. In our database, a total of 112 observations[1] have

[1] These observations include one firm in different years as well as many firms in one year. For this reason, these observations were not excluded from the analysis.

0 employees. The biggest company in terms of employees has 2,100,000 employees. About 78% of firm-year were audited by one of the Big Four accounting firms.

Table 1.5 presents the descriptive statistics for the second regression, the proxy for firm performance.

Table 1.5. Descriptive statistics of the variables to be used in the second stage regression

Variables	Obs firm-years	Mean	Std. Dev.	Min	Max
Stock Price	9,271	31.33035	47.24076	.0001	983.02
Book Value per Share	9,271	10.893	466.1237	-44436.67	1,113.125
Dividends per share	9,271	.6063909	1.840316	0	135.23
Earnings per share	9,271	1.342463	7.090467	-182.29	253.49
Dividend Yield	9,271	1.825201	4.370642	0	153.3742

The Stock Price variable, Dividends per Share, Book Value per Share and Earnings per Share are in dollar units. Dividend yield is a ratio, calculated as shown in Table 1.3. As figure in the table indicate, stock prices are on average 31 million and are highly variable, with a standard deviation of 47 million. Book Value per Share has a minimum value of -44,400 dollars and a maximum value of 1,113 dollars per share. The negative book value per share indicates that the market perceives the value of the assets is overstated. Dividends per Share has an average of 0.6 dollars, with a standard deviation of 1.8. Earnings per Share are on average 1.34 dollars and they range from -182 to 254 dollars. Dividend Yield have a minimum value of 0 and a maximum value of 153.

4. METHODOLOGY

In this paper, a two-step approach is used in order to study the effect of audit quality on the performance of North American listed firms from 2001 until 2018. The first stage estimates the audit quality dependent on Auditee Size, Complexity, Firm Risk and Big four dummy. The second stage studies the effect of Book Value, Earnings per Share, Dividends per Share, Dividend yield and estimated Audit Quality on stock prices.

The first following regression model will be used,

$$lnAudit\ fee = \beta_1\, x\, ln\, Size_{itj} + \beta_2\, x\ Complexity_{itj} + \beta_3\, x\ Risk_{itj} + \beta_4\, x\, Big\ Four_{itj} + \alpha_i + e_{itj}$$

i stands for the audit firm, **j for the company being audited and **t** for the year.*

where:

- *Audit fee* is the dependent variable and it is the fee that a company is charged by external auditors for their services in the company. This variable is transformed into natural logarithm because this way the analysis shows by what percentage audit fee changes when other variables change.
- α_i is the firm fixed unobserved effect. It can be viewed as a parameter to be estimated for each firm i. In the regression output the average of these unobserved effects is reported.
- *Size* equals Total Assets of a firm. In the basic accounting equation, assets are calculated as the sum of liabilities and stockholders' equity. To analyze the impact a change in size has on audit fees, percentages give a better picture, thus the natural logarithm of Client Size is used in the equation. Its coefficient shows the elasticity of audit fees with respect to client's size.
- *Complexity* is calculated by the total number of employees in a firm.
- *Risk* is calculated as the ratio of Total Debt to Total Equity. This ratio measures a company's financial leverage.
- *Big Four* is a dichotomous variable that takes the unit value if a firm is audited by one of the Big Four accounting firms (Deloitte Touche, PricewaterhouseCoopers, Ernst & Young, Klynveld Peat Marwick Goerdeler) and 0 otherwise.

This regression is estimated using panel data methods and the residuals are saved to be used as a proxy for audit quality in the second stage regression. The methods that will be used will be either the Fixed or Random Estimators and appropriate test will be carried out to determine the model that fits the data best. These will be explained in more details. The second regression model is presented below:

$$Stock\ Price_{jt} = \beta_1 x\ Book\ Value_{jt} + \beta_2 x\ DPS_{jt} + \beta_3 x\ EPS_{jt} + \beta_4 x\ Dividend\ Yield_{jt} + \beta_5 x\ Audit\ Quality_{jt} + \alpha_i + \varepsilon_{tj}$$

where:

- *Stock price* is the cost of purchasing a security on an exchange. Stock prices are used in this paper as proxy for performance of firms because they show the highest amount an investor is willing to pay for. Thus, the higher the price, the more willingness to pay there is, meaning that the stock is highly preferred.
- *Book value per Share* shows the value of a security or asset as it is shown in a company's books. If a company's liabilities exceed its assets, then book value becomes

negative. A high book value per share in relation to the price of the stock indicates an undervalued stock.

- *Dividends per Share (DPS)* represent the sum of declared dividends issued by a firm for each common share outstanding. This is a method used by the companies to share profit with the shareholders.
- *Earnings per share (EPS)* denote the amount of money the company is earning per outstanding share of stock. A high EPS shows that investors are willing to pay more in order to gain higher profits.
- *Dividend yield* is a stock's dividend as a percentage of the stock price.

This regression is also estimated with panel data methods. In order to test the hypothesis, this research uses the following steps:

***Step 1**: Check for multicollinearity*

Multicollinearity occurs when one of the dependent variables in a multiple regression can be linearly predicted from one or more variables in the same regression. The problem with multicollinearity is that although it does not reduce the predictive power of the model as a whole, it may inflate the variance of the estimated coefficients. The Pearson correlation test is used to test for this.

***Step 2:** Estimation of the model*

With panel data, the most commonly estimated models are Fixed Effects (FE) and Random Effects models (RE). Paper by Hunter and Schmidt (2000) discusses how a fixed-effect analysis estimates a single effect that is believed to be common in every study, whereas a random-effect analysis estimates the mean of distribution of effects. The firm fixed effect coefficients absorb all the across-group action and leave the within-group action, thus reducing the threat of omitted variable bias.

Fixed effects regression is expected to fit the data better than a random effect regression, because the characteristics of the firm dominate in the determination of stock prices. In addition, time-invariant firm characteristics not included in the model are differentiated, thus reducing the omitted variable bias, which occurs when unobservable time-variant and time-invariant factors are correlated with variables included in the regression model.

***Step 3:** Carry out a Hausman test.*

Hausman test is used to distinguish between Fixed-Effects and Random-Effects model in panel data. Under the null hypothesis, Random Effects is the preferred model due to a higher efficiency while the alternative hypothesis Fixed Effects is the consistent and thus the preferred model.

Step 4: *Diagnosis of the selected model*

The selected regression models are tested for autocorrelation and heteroskedasticity. Autocorrelation is usually a problem in datasets with a time dimension. The assumption of no autocorrelation of the error terms is tested using the Wooldridge test for autocorrelation.

Heteroskedasticity is a systematic change in the spread of residuals, which means that the size of the error term is different across values of an independent variable. The problem with heteroskedasticity is that the estimates of variances are biased which will make the statistical inference invalid.

Another diagnosis that has to be carried out is the check for the presence of outliers in the data.

Step 5: *Depending on the results of Step 3, correct the selected model accordingly.*

Hoechle (2007) summarized a selection of stata commands and respective estimators that produce robust standard errors in panel models.

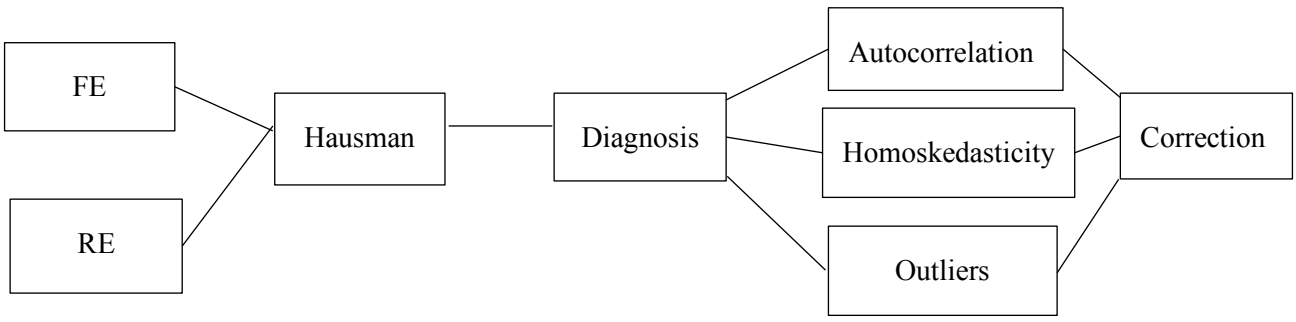
Table 1.6. Stata commands to correct standard errors

Command	Option	SE estimates are robust to disturbances being
reg, xtreg	robust	heteroskedastic
reg, xtreg	cluster ()	Heteroskedastic and autocorrelated
xtregar	rhotype(dw) lbi	Autocorrelated with $AR(1)^*$

*AR(1) refers to first order autoregression

In the figure below, a flow chart of the above-mentioned stages is presented:

Fig 1.1. Steps of the empirical procedure



5. RESULTS

This section presents the empirical findings. Firstly, as mentioned in section 4, the multicollinearity check is performed on all explanatory variables. The results from this test are presented in Appendix 1 (*Table 1.1 and 1.2*). No risk of multicollinearity is found present in either of the regression models, thus it is safe to use all variables in the analysis.

- *Applying the steps mentioned in the methodology for the first auxiliary regression model:*

After estimating the fixed and random effects models, the next step involves Hausman test. The null hypothesis is that random effects model is appropriate. The results of the regression models are shown in *Table 2.1*, Appendix 2, and the results of the Hausman test are shown in *Table 2.2*, Appendix 2. The Hausman test results show a ***p-value of 0.000***, thus the null hypothesis is rejected, and the preferred model is the Fixed Effects model.

In the fourth step, the diagnostic tests of the fixed effect model are performed. The test used to check for autocorrelation in the model is the Wooldridge test for autocorrelation in panel data. The results give a ***p-value of 0.000*** and they are shown in *Table 2.3,* Appendix 2. The null hypothesis of no serial correlation is rejected, so this shows that autocorrelation is present in the model.

To check for heteroskedasticity, the Modified Wald test for group-wise heteroskedasticity in fixed effect regression model is used. The test gives a ***p-value of 0.000,*** thus the null hypothesis that the error variance is constant is rejected (*Table 2.4*, Appendix 2).

In the last step, the estimated regression model will be corrected for autocorrelation of the error term. In order to check for the presence of any outliers in the model, the graph of residuals versus fitted value was built (*Graph 2.1*, Appendix 2). The visual inspection of the graph suggests that observations with fitted value lower than 11 and higher than 15, as well as those with residuals lower than -5 and greater than 5, can be considered as outliers and affect the coefficients of the regression. The regression was re-estimated without the observations that fall in that range. However, only minor changes of the coefficients and no changes in the significance of the coefficients were noticed. The final decision was not to exclude these observations from the estimations. The results of the final model for the first stage are presented in Table 1.7 below.

Table 1.7: First stage estimates

Dependent variable: Ln Audit fee	Fixed effect regression model			
Variable	Coefficient	Standard Error	z-score	p-value
Constant	11.55685	.2692774	42.92	0.000***
LnSize	.1897166	.0388486	4.88	0.000***
Risk	.0007839	.0063659	0.12	0.902
Complexity	.0015217	.0014546	1.05	0.296
Big four dummy	-.0225161	.0488921	-0.46	0.645
R-square within: R-square between: R-square overall:	0.0044 0.0049 0.0022			
Number of observations:	8,654			
Number of groups:	1,954			

F test that all u_i=0: F (1953, 6696) = 1.51
Prob > F = 0.0000

Note: *p<0.1 **p<0.05 ***p<0.001

As it can be seen from the table above, the logarithm of Size has a significant positive effect on the dependent variable, ceteris paribus. The variable lnSize has a positive coefficient of 0.189, which means that the elasticity of audit fees with respect to the size of the firms is 0.189.

Complexity, Risk and Big four dummy are not significant at conventional levels. The insignificant coefficient of Complexity is in line with the findings of Karim and Moizer (1996). With regards to Risk variable, Chan, Ezzamel and Gwilliam (1993) also concluded that risk does not have a significant impact on stock prices. In addition, Pong and Whittington (1994) were not able to find any evidence for a relation between the Auditor Size effect and audit fees.

From this regression model, the residuals are generated which will be used as a proxy for audit quality in the second stage regression.

- *Applying the steps mentioned in the methodology for the second regression model:*

After checking for multicollinearity, the model is estimated by both fixed and random effects. The results of these regressions are presented in *Table 3.1*, Appendix 3. In the third step, the Hausman test is performed and the results show a ***P-value of 0.000***, thus indicating that the preferred model is Fixed-Effect model, as expected. The results of the test are shown in *Table 3.2*, Appendix 3.

The fourth step involves diagnosing the error term of the model. The result from Wooldridge test for autocorrelation shows a ***P-value = 0.000***, indicating that autocorrelation is present in the model (*Table 3.3*, Appendix 3).

Another issue with this model is that the variance of estimated variables is always lower than that of an observed variable. The proxy for audit quality is estimated from the first stage regression, as quality is an abstract concept and cannot be measured. Hence, its variation is lower than that of the "real" quality, as it only depends on the explanatory variables involved in this model. In addition, given that our regressions are estimated separately, there is no guarantee that the estimated standard errors of the second stage are correct. In order to correct for the reduced variance of the error term in the second model, the *bootstrap method* with 500 replications will be performed.

The regression model in the second stage is estimated by areg, which is fit when heteroskedasticity or non-normal errors are expected. Areg fits a linear regression absorbing one categorical factor, which in this case is Company. Including firm-fixed effects, makes it feasible to control for average alterations across companies for any observable or unobservable predictors. The results of this estimation are presented in *Table 3.4*, Appendix 3. This regression was then checked for the presence of outliers by using the graph of fitted values versus the residuals. A number of observations could be considered as outliers and these include residuals smaller than -200 and larger than 200, as well as observations with fitted values lower than – 100 and greater than 500. The results of the second regression model with Company fixed effects is shown in Table 1.8:

Table 1.8: Results of second stage regression

		Number of observations: 8,517 Replications: 500 R-square: 0.8813 Adj R-square: 0.8464				Number of observations: 8,517 Replications: 500 R-square: 0.8784 Adj R-square: 0.8428			
Stock Price	Observed coefficient	Bootstrap Std. Err.	z	P> |z|		Observed coefficient	Bootstrap Std. Err.	z	P> |z|
Constant	17.3696	1.048601	16.56	0.000***		17.09984	.9373254	18.24	0.000***
Book Value per Share	.7338089	.0660051	11.12	0.000***		.7432544	.0589968	12.60	0.000***
Earnings per Share	1.672051	.305045	5.48	0.000***		1.768024	.2946051	6.00	0.000
Dividends per Share	1.812432	2.352801	0.77	0.441					
Dividend Yield	-.5970744	.3903897	-1.53	0.126					
Audit Quality	.31927	.1444403	2.21	0.027**		.3372128	.1354549	2.49	0.013**
GlobalCompanyKey	absorbed								

Note: *p<0.1 **p<0.05 ***p<0.001

The results of the regression indicate Dividends per share and Dividend yield to have a p-value larger than 0.05, which means that these variables have no significant impact on stock prices. Since these variables are not jointly significant (*Table 3.5* Appendix 3) nor individually significant, they were excluded from the final model. Book Value per Share has a positive significant impact on stock prices (with a p-value of 0.000) and a coefficient of 0.743. This means that a change in Book Value per Share by 1 dollar, changes Stock Prices by 0.743 dollars. In addition, audit quality is significant with a p-value of 0.013 and a coefficient of 0.337. This indicates that audit quality does have a positive effect in stock prices.

Based on the results found after the empirical analysis, the null hypothesis *that Audit quality has no significant effect on firm performance* is rejected. Our results indicate that it has a positive and significant effect on firm performance, as measured by stock prices.

6. CONCLUSION

Investors require trustworthiness of the information they receive; thus, they rely on audited information. Audit quality is important for investors in order to have trust in a firm's information with regards to its performance. The aim of this paper was to test the hypothesis whether audit quality affects firm performance. The critical literature review determined that stock prices are a good measure of firm performance. Investigating whether audit quality has an effect on stock prices is important because financial statements are the main source of information for making investment decisions. Audit quality increases the confidence of investors and this causes the demand for shares to increase as well. The increased demand for stocks of the firm increases their prices.

In order to estimate this causal relationship, the main problem was the unmeasurable feature of audit quality. Various authors have used indicators of Auditor Size as measures of audit quality, however it is not clear whether the audit fee reflect the market power or the quality of auditing. The innovative approach that is taken in this research estimates audit quality as the residuals of regression of audit fees on a set of explanatory variables commonly used in similar studies, investigating the determinants of audit fees. The proxy for audit quality is then used as an explanatory variable among other determinants of stock prices. In order to correct for reduced variance, the standard errors of the estimated audit quality were corrected with the bootstrap method.

Our results indicate that Dividends per Share and Dividend Yield are not significant determinants of stock prices whereas Book Value per Share and Earnings per Share have a positive and significant effect. With regards to the research question in this study,

Does audit quality affect the performance of the North American listed firms from 2001-2018?

The results indicate that the null hypothesis of no causal relationship between audit quality and stock prices is rejected.

This study encountered some limitations. The literature review suggested a wider set of explanatory variables used to explain firm performance compared to the ones included in this analysis. This limitation was due to the data availability. In addition, various authors have used various measures of firm performance, although Stock Prices is one of them, robustness check could not be carried out because of data availability. These limitations can be addressed in future research. Another limitation is the missing data, which lead to an unbalanced panel. Nevertheless, there is no pattern in the missing observations, thus the results are valid. A potential extension for future research could be the geographical diversity of the sample.

7. Appendix 1:

***Table 1.1 Pearson Correlation test**

Variables from the first regression model

	Size	Risk	Complexity	Big four
Size	1.0000			
Risk	0.0352	1.0000		
	0.0007			
Complexity	-0.3825	-0.0357	1.0000	
	0.0000	0.0006		
Big four	-0.0285	-0.0189	0.0229	1.0000
	0.0060	0.0683	0.0277	

***Table 1.2 Pearson Correlation test**

Variables from the second regression model

	Book value	EPS	DPS	Dividend yield
Book value	1.0000			
EPS	0.0468	1.0000		
	0.0000			
DPS	0.2083	0.1887	1.0000	
	0.0000	0.0000		
Dividend yield	0.0121	0.0331	0.5824	1.0000
	0.2497	0.0016	0.0000	

8. Appendix 2:

***Table 2.1 Fixed-Effect and Random-Effect regression models**

Dependent variable: lnAudit fees	Fixed effect regression model				Random effect regression model			
Variable	Coefficient	Standard Error	z-score	p-value	Coefficient	Standard Error	z-score	p-value
Constant	11.55685	.2692774	42.92	0.000***	12.64984	.0669992	188.81	0.000***
lnSize	.1897166	.0388486	4.88	0.000**	.0311514	.0082266	3.79	0.000***
Risk	.0007839	.0063659	0.12	0.902	.002601	.0053631	0.48	0.628
Complexity	.0015217	.0014546	1.05	0.296	.0000752	.0003563	0.21	0.833
Big four	-.0225161	.0488921	-0.46	0.645	.0220053	.0433006	0.51	0.611
R-square within: 0.0044 R-square between: 0.0049 R-square overall: 0.0022					R-square within: 0.0044 R-square between: 0.0047 R-square overall: 0.0020			
F (4,6696) = 7.33 Prob > F = 0.0000					corr (u_i, Xb) = 0 (assumed) Wald chi2(4) = 18.15 Prob > chi2 = 0.0012			

Note: *p<0.1 **p<0.05 ***p<0.001

***Table 2.2 Hausman test**

	Coefficients (b) Reg FE	(B) Reg RE	(b-B) Difference	Sqrt(diag(V_b-V_B0) S.E.
Lnsize	.1897166	.0311514	.1585653	.0379676
Risk	.0007839	.002601	-.0018171	.0034295
Complexity	.0015217	.0000752	.0014465	.0014103
Big four	-.0225161	.0220053	-.0445214	.0227044

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)
= 25.24
Prob>chi2 = 0.0000

***Table 2.3 Autocorrelation Test**

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F (1, 789) = 51.194

Prob > F = 0.0000

***Table 2.4 Heteroskedasticity Test**

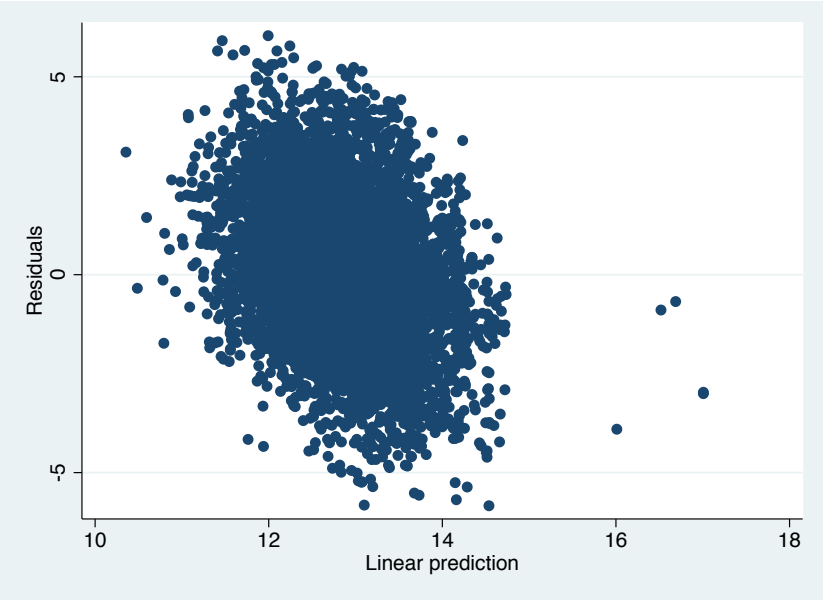
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (1954) = 2.8e+37

Prob>chi2 = 0.0000

***Graph 2.1 Residuals vs Fitted Values**



9. Appendix 3:

***Table 3.1 Random-Effect and Fixed-Effect regression model**

Dependent variable: Stock Price	Fixed effect regression model				Random effect regression model			
Variable	Coefficient	Standard Error	z-score	p-value	Coefficient	Standard Error	z-score	p-value
Constant	18.40884	.3490471	52.74	0.000***	14.42661	.4810401	29.99	0.000***
Book Value	.699983	.0175752	39.83	0.000***	.8493684	.0131662	64.51	0.000***
Earnings per Share	1.56427	.0713485	21.92	0.000***	1.831482	.0668829	27.38	0.000***
Dividends per Share	1.952038	.1770179	11.03	0.000***	2.689102	.173748	15.48	0.000***
Dividend Yield	-.6374917	.0777963	-8.19	0.000***	-.7590169	.0740592	-10.25	0.000***
Audit Quality	.3273592	.1532488	2.14	0.033**	-.1351249	.1471775	-0.92	0.359
R-square within: 0.3369 R-square between: 0.6943 R-square overall: 0.6311					R-square within: 0.3357 R-square 0.6991 between: 0.6336 R-square overall:			
corr(u_i, Xb) = 0.4108 F (5,6593) = 670.05 Prob > F =0.0000					corr(u_i,X) =0 (assumed) Wald chi2(5) = 7754.85 Prob > chi2 = 0.0000			

Note: *p<0.1 **p<0.05 ***p<0.001

***Table 3.2 Hausman test**

	Coefficients (b) Reg FE	(B) Reg RE	(b-B) Difference	Sqrt(diag(V_b-V_B0) S.E.
Book Value	.699983	.8493684	-.1493854	.0116422
Earnings per Share	1.56427	1.831482	-.2672129	.0248453
Dividends per Share	1.952038	2.689102	-.7370634	.0338671
Dividend Yield	-.6374917	-.7590169	.1215252	.0238222
Audit Quality	.3273592	-.1351249	.4624841	.0427081

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B) ^(-1)] (b-B)

= 1083.37

Prob>chi2 = 0.0000

***Table 3.3 Autocorrelation Test**

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F (1, 782) = 31.653
Prob > F = 0.0000

***Table 3.4 Heteroskedasticity Test**
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

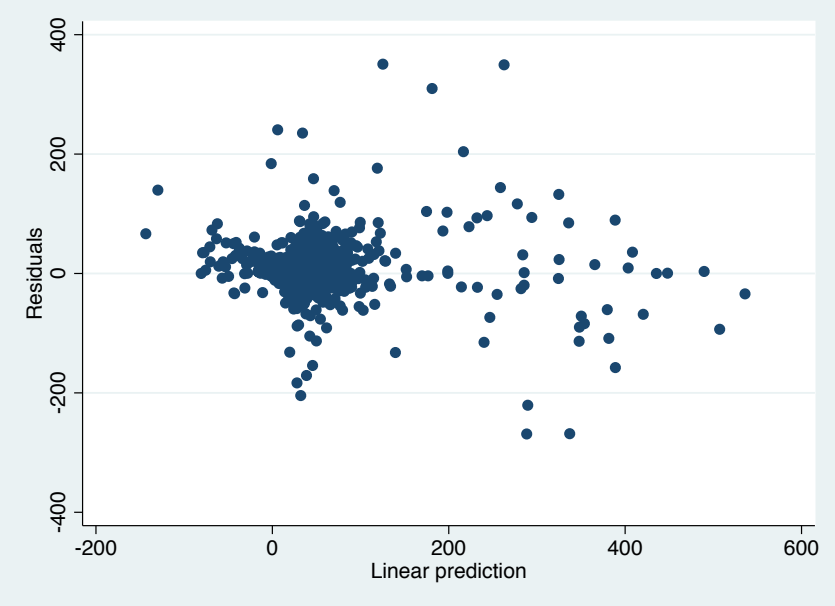
chi2 (1929) = 2.6e+37
Prob>chi2 = 0.0000

***Table 3.5 Joint significance Test**

(1) DividendsperSharePayDate = 0
(2) dividendyield = 0

chi2(2) = 3.75
Prob > chi2 = 0.1530

***Graph 3.1 Residuals vs Fitted Values**



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