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## Audit fee and banks' communication sentiment

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### ABSTRACT

The study verifies the relationship between the audit fee and reporting sentiment in the banking industry. The research adopts panel data from a sample of 490 commercial banks across 43 US states for years 2000–2016. The results indicate that the audit fee is affected by the sentiment and is subject to time development. The research shed light on the nature of auditor relations in the specific economic context of the US. The results add to the science new and robust evidence on attitudes towards asymmetry friction in the supervised market. The Financial Authorities might benefit from the presented results while preselecting the entities for on-site inspection.

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M21; M42; G21

## 1. Introduction

This study asks whether the audit fee is affected by the financial reporting sentiment. The sentiment is measured as the relation of positive to negative words in 10-K form.

Our study is grounded in agency and information asymmetry theory. The separation of ownership and control has encouraged agency conflict between managers and owners (Fama & Jensen, 1983; Grossman & Hart, 1988; Jensen & Meckling, 1976; Mirrlees, 1976; Stiglitz, 1974). Thus, a central focus for corporate governance is the reduction of agency costs produced due to manager and shareholder information asymmetry. The reduction of those costs should increase a firm's value (Sánchez-Ballesta & García-Meca, 2007). Information asymmetry theory emphasises that managers of private companies have better information about the value and quality of their business than external investors. Consequently, if managers find in financial statements that their business is a better investment than others, they can increase the reputation and value of their company by employing a high-quality auditor, who can expect to be remunerated more. One aspect of corporate governance is the relationship between the auditor and company management and other stakeholders. Since the global financial crisis, it has been widely argued by banking supervisors and

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regulators that corporate governance can be considered a mechanism for addressing stability problems and controlling risk within the bank (Walker, 2009).

The motivation for the study was primarily the recent crisis in 2007-2008, which showed that risk management in the financial sector does not always have the expected results. In particular, there have been known examples where institutions or securities issues rated as high investment grade by rating agencies have turned out to be bankrupt or worthless.

The added value of the study stems from the fact that we undertake the verification of hypotheses for the financial sector that have already been tested in a non-financial firm setting. This is confirmed by the literature review performed. Most audit fee studies (Copley & Douthett, 2002; Mark L. DeFond et al., 2000) exclude financial institutions because banks have specific activities. However, our analysis focuses on the banking industry for numerous reasons. The banking industry is a good scene in which to investigate auditor independence and the implications of audit quality due to its homogeneity in contrast to industrial firms. The banking industry is critical to national and global economies in their role as depository institutions and lenders to both corporations and individuals. Compared to industrial firms, financial institutions have a number of distinct characteristics (Lobo, 2017) like a high degree of leverage relative to others. Leverage causes exacerbating risk-taking concerns because the government guarantees are increasing with leverage, which leads to magnified benefits of increasing bank risk for highly leveraged banks (Brunnermeier, 2009; DeYoung et al., 2013; Mehran et al., 2011). The governance structure of banks is different to non-financial firms (Karkowska & Acedański, 2019; Macey & O'Hara, 2003). Banks deal with a higher degree of information uncertainty than other firms. Banks are highly regulated (Alford, 2010; Bank for International Settlements, 2015; Committee on Banking Supervision, 2010, 2014; Walker, 2009). Unlike industrial companies, the litigation risks associated with bank audits stem from actions brought by both shareholders and the federal government. (Fields et al., 2004). In contrast to industrial entities, the banks rely more heavily on the fair value valuation of their assets, thus its fluctuation translates into a higher dynamic of insolvency.

We focused our analysis on US, because by limiting the scope of research to one country and a homogenous industry, we controlled the range of a set of variables that cannot be as convincingly controlled in cross-country and cross-industry data. Thus, the effect of sentiment is isolated from factors such as the type of company, legal origins, and other country-wide characteristics. Application of cross-country sentiment with different lingual roots requires a plausible sentiment reconciliation between different languages. The US did not fully implement the Basel Accords, thus for the entire period of observation, our dataset is stable in respect of risk measurement. This gives us a unique opportunity to judge the audit fee and communication sentiment nexus. Additionally, the US reporting to the Security Exchange Commission (SEC) is highly heterogeneous in terms of content.

Using the panel regression model, we test the hypotheses and analyse the relation between the audit total fee and the bank's 10-K form sentiment. We sampled 490 firms from 43 US states, our data set comprises a period of 17 years, 2000-2016 with

5356 year-firm observations. Our study is, to our knowledge, the first attempt to track the relationship between the audit fee and 10-K form sentiment on a large scale in the banking industry.

This paper addresses the limitations in the current literature on the relationship between auditors and the way the company communicates its results to stakeholders. This paper also contributes to the literature on banking corporate governance research in several ways.

Firstly, it provides robust evidence of the impact of the reporting sentiment on the auditor's fee. We extend the general audit fee model into a modern institutional context of communication sentiment and risk-taking. The auditors charge higher fees in line with the more positive communication presented by the banks in 10-K form. Those results are robust to various specifications but conditioned on time effects.

Secondly, our proposal allows us to spread the general audit fee model into a very rich formal setting, which is banking. The fee model expanded in this paper includes a score of measures that are special to the banking industry. A survey of the relationship between the audit firm and banking supervision is also crucial due to the high volume of litigation risk in this industry. In contrast to industrial entities, the litigation risks related to bank audits results from their shareholders and the government. As bank auditors are subordinated to regulatory inspection, we suppose that bank audit fees are probably connected to regulative risks. Therefore, our paper should be helpful to accounting companies, which rate their litigation exposition in this high-risk sector (Palmrose, 1988).

Thirdly, this study is relevant because of the transparency of a bank's financial condition. According to the Basel Capital Accord, the valuation of capital adequacy depends on the bank's transparency and market discipline. Thus, auditors play an essential function in providing this transparency. The research examines bank audit pricing empirically, thus the audit fee model incorporates measures that are unique to financial institutions.

Finally, we also provide evidence that the audit fee of the BigN companies reacts less to sentiment than other audit firms. Verification of bank governance and audit firms is also important due to the high levels of litigation risk in this sector, unlike industrial companies. (Fields et al., 2004) report that in November of 1992 Ernst and Young was required to pay the US government \$400 million to settle claims related to deposit failures. The amount was ten times larger than the largest previous settlement for industrial companies. In view of the nature of the risks in the banking sector of the economy, and the specific surveillance put in place over the last decade after the Global Financial Crisis (2007-2008), it is worth taking a closer look at this phenomenon. As bank auditors are the target of widespread regulatory investigation, we examine if bank audit fees are tied to bank risks.

The paper proceeds as follows. [Section 2](#) provides a literature review on audit fees as part of corporate governance and our hypotheses. [Section 3](#) presents our sample, descriptive statistics, and methodology. [Section 4](#) presents our empirical results, while [Section 5](#) presents robustness checks for our model. [Section 6](#) provides the discussion and the last section concludes.

## 2. Literature review and hypotheses development

The initial frictions of sentiment analysis were costs, data, and hardware. Due to those limitations, there was a consistent imbalance between the available theoretical framework and its application. In the 1990s, the spread of the Internet and the down-sizing of computing costs accelerated the application development of empirical research. Emerging technologies entered the application level like optical character recognition (OCR), electronic general ledgers, cloud services (including cloud computing), blockchain, and smart contracts. In finance and reporting, the digitalization of public registers and filings has resulted in an abundant flow of structured data. For example, the SEC since the early 1990s has gradually implemented electronic reporting, while in 2012 imposed the ultimate obligation for the XBRL reporting of US public companies (The US Securities and Exchange Commission, n.d.). This, in turn, results in the renaissance of textual analysis in finance. Kearney and Liu (2014) offer an overview of the application of textual analysis both in terms of methods and research areas. Prior studies report the link between sentiment and various aspects of corporate governance.

Skinner (1994) showed that in earnings facultative disclosure, good news disclosures tend to be precise, while bad news disclosures tend to be qualitative. You and Zhang (2009) analyzed the immediate and delayed market reaction to the 10-K filing. Authors reported that investors' underreaction is stronger for firms with more complex 10-K reports. Li (2008) and Lehavy et al. (2011) report that less readable 10-K forms affect greater uncertainty in earnings forecasting. (Bodnaruk et al., 2015) claim that the textual analysis predicts subsequent liquidity events, such as dividend omissions or increases, equity recycling, and underfunded pensions, better than financial variables. Law and Mills (2015) showed the link between negative sentiment and aggressive tax planning. Purda and Skillicorn (2015) claimed that linguistic analysis is well-suited to identifying unusual discrepancies in financial reporting.

The problem of the relationship between corporate governance and bank risk is not new. Researchers studied this dependence during previous crises. The Basel Committee on Banking Supervision (Committee on Banking Supervision, 2010) highlights that 'effective corporate governance practices are essential to achieving and maintaining public trust and confidence in the banking system, which are critical to the proper functioning of the banking sector and the economy as a whole' (p. 13). Many studies investigate poor or weak corporate governance in the banking sector (Fortin et al., 2010; McNulty & Akhigbe, 2017; Peni & Vähämaa, 2012). Fundamental audit and assurance fee studies (DeAngelo, 1981; M. DeFond & Zhang, 2014; M L DeFond et al., 2002; Simunic, 1980) exclude financial institutions because of the specific characteristics of the banking industry. Fields et al. (Fields et al., 2004) offered a banking tailored model for the audit fee. Thus, we link the discussion on banking sector governance with the gatekeepers' function and 10-K sentiment.

Gandhi, Loughran, and McDonald (Gandhi et al., 2019) offered the analysis of the impact of the 10-K form sentiments as the distress predictor. Authors applied sentiment analysis to the Annual Reports in US banks. They showed the existence of the link between the delisting of a company and the relative frequency of negative words in the 10-K form. This, in turn, might support the authorities besides the capital

requirements for the monitoring of the banking industry. The authors, however, did not control their setting of the impact of gatekeepers on the financial statement closing process. In this paper, we enhance the Gandhi et al. perspective and carry forward the issue on the sentiment impact on auditors. Smales (2016) found the asymmetric relationship between the sentiment of newswire messages for a set of banks and changes in credit measures: the LIBOR-OIS spread and the CDS spread. Recently, (Bicudo de Castro et al., 2019) reported that annual reports that convey an optimistic tone are associated with lower audit fees. Their analysis was based on the Australian Stock Exchange and excluded firms from the financial sector. As such, the study on the sentiment and audit pricing are rare across the literature (H. Chen et al., 2021; Drăguşin et al., 2021; Gupta et al., 2020; Jokar & Daneshi, 2020; Luo & Zhou, 2020; Yang et al., 2021), that opens a research gap in respect of the financial industry which led us to the following working hypothesis:

H1. Banks that provide positive sentiment in annual reports are associated with lower audit fees than those with negative.

We limited the study to the banking section not only because of the above gap but because the textual analysis might be affected by industry class. By limiting the study to the homogenous segment of the market, which uses similar technical jargon and undergoes similar supervisory requirements, we gathered a more homogenic sample at the cost of the entity's activity diversification. This, in turn, allows us to gather more persuasive and robust evidence on the examined relationship.

The global audit market is dominated by a small number of the international audit companies (called BigN), thus our analysis might suffer from competition bias. Therefore, we test the level of idiosyncrasy of major audit companies in respect of their pricing policy, which led us to the next working hypothesis:

H2. There is uniform pricing policy for banks across major audit services providers.

If our second hypothesis is confirmed, then the pricing mechanism of the market and its efficiency is jeopardized, thus the conclusion derived from the first hypothesis would be less convincing. In contrast, the rejection of H2 enhances our knowledge about the audit pricing mechanisms in the competitive market.

### **3. Data, sentiment and methodology**

#### **3.1. Data and sample**

We drew the source data from the Bankscope database (Bureau van Dijk, 2017), Audit Analytics (Ives Group Inc, 2019), and the full text of the 10-K forms were collected from the SEC EDGAR Database for the period 2000-2016. The period of analysis was limited to 2000-2016 to maintain consistency with audit reporting due to the inception of critical audit matters gradual implementation in PCAOB Release No. 2017-001 (Public Company Accounting Oversight Board, 2017) and as our access to Bankscope data was restricted. However, this is a sufficient period to draw meaningful conclusions. We sampled companies from 6 US regions (Mid Atlantic, Midwest, New England, Southeast, Southwest, and West) including 43 US states. Finally, our usable sample consisted of 490 banks and 126 auditor firms from 2000 through 2016.

**Table 1.** Banks distribution among 17 years across 6 US regions.

Year	Mid Atlantic	Midwest	New England	Southeast	Southwest	West	Total banks
2000	68	54	14	36	6	23	201
2001	75	72	16	43	8	31	245
2002	85	76	16	45	8	37	267
2003	90	76	16	50	8	36	276
2004	95	71	17	55	10	42	290
2005	108	73	18	62	9	46	316
2006	124	82	20	77	9	51	363
2007	131	85	20	74	9	54	373
2008	131	78	20	70	8	52	359
2009	132	78	22	67	9	52	360
2010	134	79	24	67	9	52	365
2011	138	82	24	68	9	54	375
2012	132	76	23	63	11	54	359
2013	130	74	27	66	13	52	362
2014	130	75	29	71	14	54	373
2015	129	73	33	70	14	52	371
2016	133	77	33	68	16	53	380

Source: own study.

Table 1 presents banks distribution among 17 years in 6 US regions. The data were combined into an integrated dataset application of the CIK and year as the integrated index.

The total number of year-firms observation is 5,356 in the unbalanced panel data. Table 2 provides an overview of the dataset.

### 3.2. Sentiment of 10-K form

The research applies panel regression on data raised from the annual reports (10-K form) filed with the SEC between 2000 and 2016. The approach most widely used to transform the narrative into a numeric value that represents the tone is to count the frequency of a predefined list of “positive” versus “negative” words (Henry & Leone, 2016). While measuring the tone or sentiment of a financial document, the count of the number of words associated with a particular sentiment word list is scaled by the total number of words in the document (Loughran & McDonald, 2016). This study applied both a positive and negative dictionary as suggested by the Loughran and McDonald Financial Sentiment Dictionaries<sup>1</sup> and implemented in the R EDGAR package (Bodnaruk et al., 2015; Lonare & Bharat, 2017; Loughran & McDonald, 2014). A 10% frequency limit was imposed for both dictionaries to avoid biases resulting from an individual firm’s communication style and case-specific jargon. In this study, we follow Henry and Leone (2016) and define sentiment as the relation of positive to negative words in a given 10-K form as follows:

$$SENT_{i,t} = \frac{\sum_j^P POZ_j - \sum_n^K NEG_n}{\sum_j^P POZ_j + \sum_n^K NEG_n} \quad (1)$$

Where

$SENT_{i,t}$  is the fraction of the sum of net positive word occurrence over total positive and negative word occurrence for a given 10-K form. Subscript  $i$  represents the company, while  $t$  the year of filing.  $POZ_j$  is the number of occurrences of the  $j$

**Table 2.** Data structure basic overview.

<i>Banks sample characteristic</i>	<i>2000 year</i>	<i>2016 year</i>
<i>1. Number of entities</i>	<i>191</i>	<i>357</i>
<i>2. Mean of total assets USD</i>	<i>1.45e + 10</i>	<i>2.64e + 10</i>
<i>3. Mean of capital USD</i>	<i>1.17e + 09</i>	<i>3.08e + 09</i>
<i>4. Mean of ROA</i>	<i>1.018454</i>	<i>.8786473</i>
<i>Auditors' sample</i>		
<i>1. Number of audited banks</i>	<i>191</i>	<i>357</i>
<i>2. Mean of audit fee USD</i>	<i>411599.1</i>	<i>1252230</i>
<i>3. Mean of non-audit fee kUSD</i>	<i>126396.1</i>	<i>345068.7</i>

We drew the sample of 490 banks and 126 audit firms across 43 US states for the years 2000-2016.

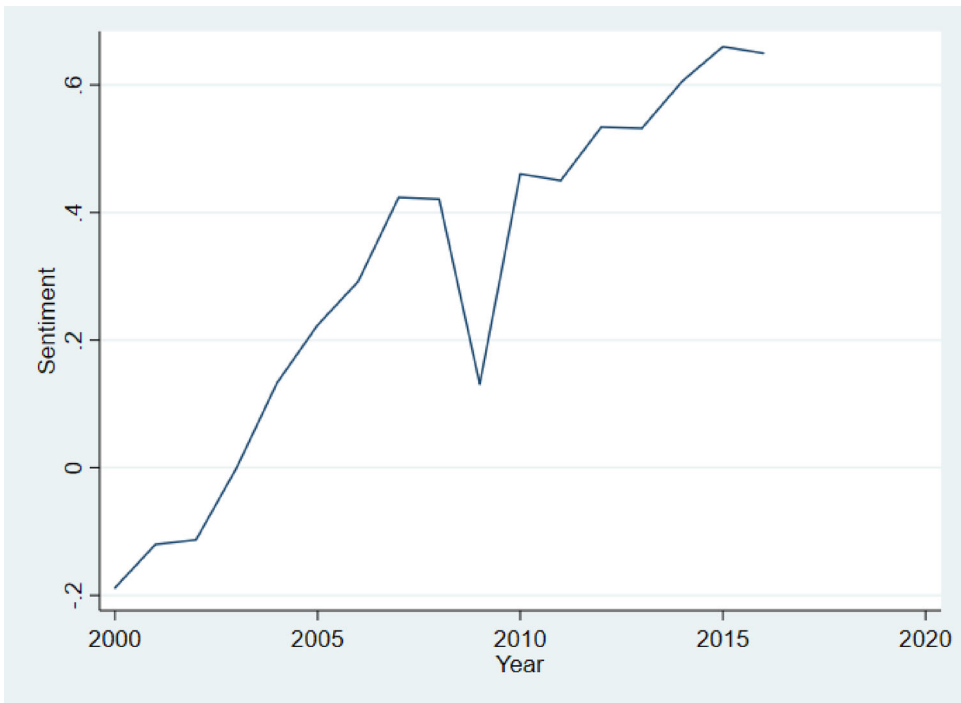
Source: own study.

positive words in a 10-K form, where  $P$  is the number of positive words which occur in each 10-K at least once.  $NEG_n$  is the number of occurrences of the  $n$  negative words in the 10-K form. [Figure 1](#) shows the average development of sentiment value between 2000 and 2016.

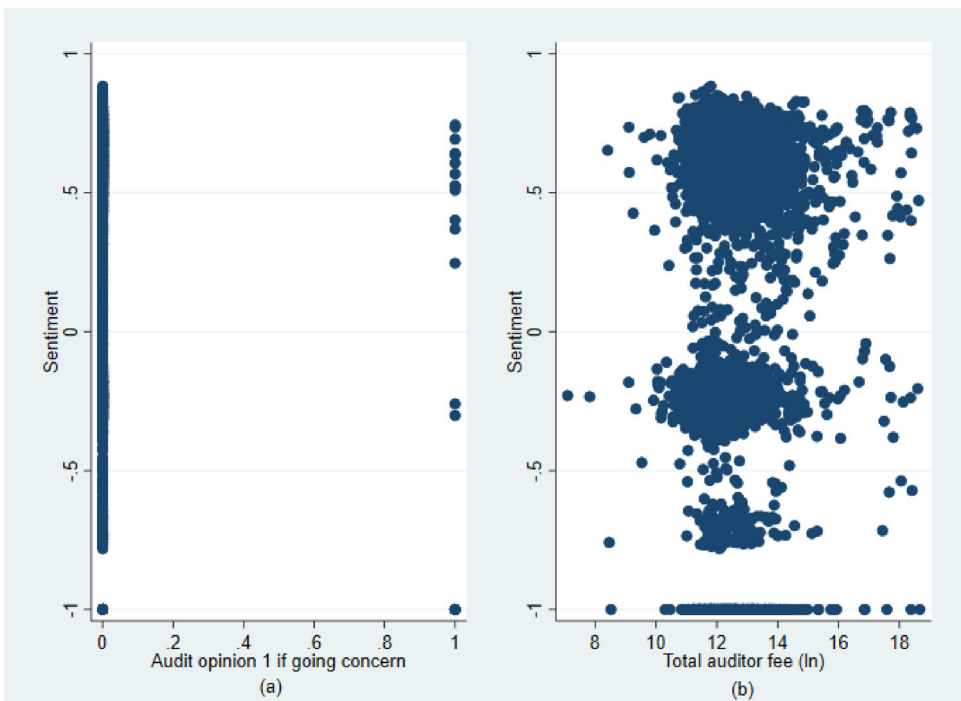
In average with the sentiment data, we observe a steady increase of sentiment in the US banking industry since 2000 except for 2009 (a consequence of Lehman Brothers bankruptcy). The descriptive statistics reconcile to the macroeconomic picture of the US banking industry.

Extant literature offers different specifications for audit fee measurements. Since the audit fee and not the audit fee suffer from potential endogeneity (D. Hay et al., 2006; Whisenant et al., 2003), the decomposition of the total auditor remuneration might introduce the bias in the model estimation, thus we applied the total proxy. We control the model with the going concern risk (audit opinion variable). The auditor while negotiating the audit fee, possess information on the priory audit results and predicts the financial situation of the auditee at the date of issuing the audit report. The past anticipate going concern issue results in an incremental increase of the detection risk and the need to perform additional audit procedures. Thus, the going concern risk motivated the audit firm to claim additional remuneration from the auditee for the incremental audit effort. Previous studies show that the BigN audit firms earn fee premiums (D. C. Hay et al., 2006), therefore, we control for the BigN audit firms (10 top audit companies) in the regression. In this study, our variable of interest is sentiment. For the bank-specific variables, we applied a set of controls derived from the prior studies (Chu et al., 2018). Our sample was restricted to financial institutions, thus, contrary to (Fields et al., 2004) we used the sentiment wide range of a bank risk proxy. We used standard control variables as total assets (L. Chen et al., 2018). We employ the ZSCORE (Lepetit & Strobel, 2013) as a banking risk measure. It is a popular indicator of a bank's probability of insolvency. We applied the ZSCORE as the risk metric instead of the capital requirements because Gandhi et al. (Gandhi et al., 2019) claimed that "bank managers consistently ensure the Capital Adequacy ratio is at acceptable levels, the variable has a very limited predictive ability" (p. 8). Additionally, we used loan to deposit ratio as the liquidity risk measure and loan loss provision presenting the bank's credit risk. To account for the subindustrial effect, we distinguished the commercial banks within the sample. We controlled competition in the sector between the auditors by applying a proxy for the 10 biggest audit companies in the market. [Table 3](#) presents the definition of used variables.





**Figure 1.** Time series of the average sentiment by years.  
Source: own study.



**Figure 2.** Scatterplots of type of audit opinion – panel (a) and total audit fee – panel (b) versus sentiment value.  
Source: own study.

**Table 3.** Variables definitions.

<i>Variables</i>	<i>Definition</i>	<i>Source of data</i>
<b>Panel A: Audit variables</b>		
AUDIT_FEE	The natural logarithm of the total audit fee	Audit Analytics (Ives Group Inc, 2019)
SENT	Sentiment as the relation of positive to negative words in a given 10-K form as follows Eq. (1.1)	10-K forms from EDGAR (The U.S. Securities & Exchange Commission, 2019)
AUDIT_OPINION	Value of 1 for the going concern 0 otherwise	Audit Analytics (Ives Group Inc, 2019)
<b>Panel A: Bank's specific variables</b>		
SIZE	The natural logarithm of total assets	Bankscope database (Bureau van Dijk, 2017)
ZSCORE	Bank's probability of insolvency, following (Lepetit & Strobel, 2015)	Bankscope database (Bureau van Dijk, 2017)
LOAN_DEPO	Liquidity ratio bank's loans to deposits	Bankscope database (Bureau van Dijk, 2017)
LLP	Bank's loan loss provision ratio	Bankscope database (Bureau van Dijk, 2017)
<b>Panel A: Dummy variables</b>		
DUM_NAICS	1 for commercial banks, 0 otherwise	Bankscope database (Bureau van Dijk, 2017)
DUM_AUDITOR	1 auditor quality proxied by top 10 auditors, 0 otherwise	Audit Analytics (Ives Group Inc, 2019)

Source: own study.

The analysis was performed using the R language (Feinere & Hornik, 2015; Lonare & Bharat, 2017; R Core Team, 2018) for 10-K form retrieval, Statistica (TIBCO Software Inc, 2017) for text mining and Stata (StataCorp, 2015) for general statistics.

### 3.3. Methodology

We applied panel instrumental regression. We used the logarithm of the total audit fee as the explained variable. We measured both audit and non-audit fees, as priori studies indicate the mutual dependency of both elements of auditor remuneration (D. Hay et al., 2006; Whisenant et al., 2003). We based our specifications on (Fields et al., 2004). We enhanced the initial model with a set of binary variables to control the different subindustry effects and the auditor market concentration.

The abbreviated analytical form of our model shows the following specifications:

$$\begin{aligned}
 AUDIT\_FEE_{n,t} = & \beta_1 AUDIT\_OPINION_{n,t} + \beta_2 SENT_{n,t} + \beta_3 SIZE_{n,t} + \beta_4 ZSCORE_{n,t} \\
 & + \beta_5 LOAN\_DEPO_{n,t} + \beta_6 LLP_{n,t} + \beta_7 DUM\_NAICS_t \\
 & + \beta_8 DUM\_AUDITOR_t + u_n + \varepsilon_{n,t}
 \end{aligned}
 \tag{2}$$

In Eq. 2, AUDIT\_FEE is the natural logarithm of the total audit fee; SENT is sentiment as the relation of positive to negative words in a given 10-K form as follows Eq. 1.1; AUDIT\_OPINION is a binary variable indicating that the auditor disclosed a going concern issue; SIZE is the natural logarithm of total assets; ZSCORE is a popular indicator of a bank's probability of insolvency, following (Lepetit & Strobel, 2015); LOAN\_DEPO is the liquidity ratio of the bank's loans to deposits; LLP is the bank's

**Table 4.** Descriptive statistics continuous variables.

Variable		Mean	Std. Dev.	Min	Max	Observations
AUDIT_FEE	overall	12.57322	1.24054	7.090077	18.66754	N = 5355
	between		1.118685	9.376871	18.17737	n = 488
	within		0.459986	8.369671	14.9464	T bar = 10.9734
AUDIT_OPINION	overall	0.006721	0.081716	0	1	N = 5356
	between		0.039508	0	0.444444	n = 488
	within		0.072317	-0.43772	0.947898	T bar = 10.9754
SENT	overall	0.237795	0.561083	-1	0.883906	N = 3783
	between		0.29531	-1	0.771964	n = 412
	within		0.508707	-1.33962	1.61436	T bar = 9.18204
SIZE	overall	21.08306	1.591418	17.08005	28.44855	N = 5312
	between		1.511762	17.85759	28.10413	n = 488
	within		0.371885	18.42316	23.12898	T bar = 10.8852
ZSCORE	overall	3.472875	4.145569	-3.86761	83.93786	N = 5197
	between		6.7034	-1.33607	83.93786	n = 464
	within		0.971291	-0.45558	7.335283	T bar = 11.2004
LOAN_DEPO	overall	14.12056	199.3627	-81.4136	10143.42	N = 5195
	between		44.47976	-38.7184	722.8005	n = 478
	within		192.7372	-763.24	9490.741	T bar = 10.8682
LLP	overall	1.772578	2.73774	0	100.1934	N = 2959
	between		1.29002	0	9.539809	n = 356
	within		2.447083	-5.53069	94.37245	T bar = 8.3118

Source: own study.

loan loss provision ratio; DUM\_NAICS is the dummy variable for the type of bank; DUM\_AUDITOR is the dummy variable for auditor quality proxied by the top 10 auditors. The indexes  $n$  and  $t$  represent the company and year, respectively. The  $u_n$  represents the individual error term of the company, while the  $\varepsilon_{n,t}$  is the error term. Our initial specifications suffered from heteroscedasticity; thus, we trimmed the observation on the 99<sup>th</sup> quantile and applied a robust standard error estimator.

The value of the audit contract is by definition prior to the audit opinion and the financial statements; however, the past audit opinion might impact the valuation of the audit contract by the incumbent auditor, thus we enhanced our specification with the lagged audit opinion.

Our sample is driven from all reported banks in the industry through the substantial period. During this period, some of the banks commence activities while others leave the market, due to that our sample is unbalanced. To assess the impact of the potential selection bias on our model, we applied the Hausman test.

#### 4. Empirical results

In Table 4, we report the descriptive statistics of model variables.

The descriptive statistics indicate the lack of all the data in all variables across the dataset and thus the different specification of the models does not share the same number of observations.

We analysed the descriptive statistics, probably the most intuitive result of our examination is the scatterplot of the type of audit opinion and auditor fee against the sentiment.

We observed a general relation that, as shown in Figure 2(a), modification of the audit opinion softens on how the auditors describe such an adverse communication

to shareholders. The relationship between the total auditor fee and the sentiment value is clustered into four groups, strong positive, slightly adverse, adverse, and completely negative [Figure 2\(b\)](#). Thus, application of the Ordinary Least Squares (OLS) estimator is not necessarily a valid approach and the variance homoscedasticity can be affected. Therefore, we applied a robust estimation. The set of control's variables namely SIZE, ZSCORE, LOAN\_DEPO, and LLP, precise value for the current financial statements are usually unknown at the date of the signing off the audit contract. Thus, the auditor casts a forecast based on the most recent interim financial statements or relates back to the last years audited statements. Therefore, on the current, total audit fee might impact the current value of the balance sheet (e.g., in the form of the additional time load charge) or the past values known at the contract date. Thus, to control those effects, we included period lagged control variables.

As the lagged change in audit fee becomes a significant variable in the current sentiment explanation, we applied the instrumental setting to reflect such a relationship. Following the research of You and Zhang (2009), Li (2008), Lehavy et al. (2011) and Bodnaruk et al. (Bodnaruk et al., 2015), we applied the market-related instrument for sentiment. As the proxy for sentiment we used both market price and stock capitalisation. [Table 5](#) shows the results of the regression analysis.

[Table 5](#) presents eight models of the relation between the auditor fee and sentiment of the 10-K forms. In the base model (1) the baseline instrumental regression on levels without any lags and controls related to the subindustries, time, and major individual auditor's effects. Model (2) shows the baseline model with one period lagged variable. Model (3) includes controls for the subindustries: Commercial Banking, Offices of Bank Holding Companies, Savings Institutions (NAICS\_Codes = 522110, 522120, and 551111), and 10 major audit companies in the market. Model (4) shows output while the sentiment variable is censored at 1 and 99th, while Model (5) presents Model (3) estimation on the panel. Models (6) to (8) are comparable to Models (3) to (5) while the auditors' control is replaced with the year effects. Corresponding to studies implying industrial companies, audit fees are higher for bigger banks. We also discover that both of our specific measures of insolvency risk are statistically significant and indicate that an increase of loan loss provision (LLP) results in growth of the audit fee. On the other hand, a decrease in the risk of insolvency measured by the ZSCORE index leads to a reduction in the audit fee. These results suggest that an optimistic tone is likely to be associated with lower banking risk, which leads to lower audit efforts and reduced audit fees. However, this relation is maintained only for the lagged variable. Sentiment of messages reflected in annual reports is positively related to audit fees, indicating that a greater proportion of positive tone messages requires more attention from auditors. These findings are contradictory to other studies that have been performed for nonbanking entities (Bicudo de Castro et al., 2019; L. Chen et al., 2018). This may imply the existence of other factors, which generate additional charges. Since the global financial crisis of 2007-2009, the banking sector has been subject to special attention and supervision, which may, on the one hand, stimulate higher expectations of positive evaluation in annual reports (optimistic sentiment) and, on the other hand, demand a higher fee from auditors.

**Table 5.** Audit fee and sentiment in the US banking industry, 2000–2016.

	BASE_0 (1)	BASE_L (2)	CONT (3)	CONT_CENT (4)	CONT_BA (5)	YEARS (6)	YEARS_CENT (7)	YEARS_BA (8)
SENTIMENT	0.398*** (0.135)	0.336* (0.179)	0.523* (0.281)	0.509* (0.286)	0.556 (0.423)	-0.771 (2.715)	-1.202 (3.287)	-1.224 (2.571)
L		0.028* (0.015)	0.045*** (0.015)	0.044*** (0.015)	0.011 (0.032)	0.255 (0.855)	0.358 (0.973)	0.422 (0.902)
AUDIT_OPINION	0.254** (0.113)	0.225 (0.141)	0.264* (0.160)	0.263* (0.159)	0.076 (0.160)	0.225 (0.153)	0.224 (0.170)	0.134 (0.200)
L		0.113 (0.104)	0.112 (0.117)	0.113 (0.115)	0.252 (0.194)	0.133 (0.107)	0.132 (0.119)	0.088 (0.114)
SIZE	0.684*** (0.018)	0.590*** (0.080)	0.541*** (0.088)	0.537*** (0.086)	0.661*** (0.152)	0.473** (0.186)	0.457** (0.195)	0.463* (0.257)
L		0.074 (0.092)	0.032 (0.122)	0.037 (0.120)	-0.127 (0.242)	0.200 (0.184)	0.197 (0.186)	0.161 (0.222)
ZSCORE	-0.022*** (0.005)	-0.006 (0.008)	-0.011 (0.010)	-0.010 (0.010)	-0.024 (0.018)	-0.002 (0.012)	0.001 (0.015)	0.008 (0.030)
L		-0.021** (0.009)	-0.033** (0.013)	-0.033** (0.013)	-0.031* (0.016)	-0.018 (0.019)	-0.023 (0.026)	-0.034 (0.031)
LOAN_DEPO	-0.113 (0.080)	-0.297 (0.185)	-0.467* (0.270)	-0.453* (0.270)	-0.444 (0.451)	0.042 (0.212)	0.067 (0.265)	0.041 (0.266)
L		0.257 (0.277)	0.519 (0.425)	0.500 (0.427)	0.494 (0.696)	-0.180 (0.118)	-0.150 (0.163)	-0.336 (0.226)
LLP	0.060** (0.024)	0.052* (0.027)	0.077* (0.041)	0.075* (0.041)	0.068 (0.056)	0.015 (0.023)	0.020 (0.029)	0.029 (0.052)
L		-0.007 (0.014)	-0.012 (0.016)	-0.011 (0.016)	-0.016 (0.022)	-0.022 (0.090)	-0.037 (0.109)	-0.051 (0.111)
Constant	-1.827*** (0.350)	-1.429*** (0.501)	0.053 (1.290)	0.022 (1.313)	1.060 (2.644)	-1.552*** (0.505)	-1.241** (0.569)	-0.326 (1.139)
Observations	2992	2962	2962	2932	1868	2962	2932	1868
Banks	351	351	351	351	154	351	351	154
r2_w	0.198	0.214	0.182	0.181	0.184	0.153	0.089	0.115
r2_b	0.864	0.865	0.840	0.842	0.867	0.860	0.826	0.880
r2_o	0.817	0.824	0.787	0.789	0.774	0.797	0.731	0.744
Auditors FE	NO	NO	YES	YES	YES	NO	NO	NO
Subindustry FE	NO	NO	YES	NO	YES	YES	YES	YES
Years	NO	NO	NO	NO	NO	YES	YES	YES

Standard errors are in parentheses.

\*\*\* $p < .01$ .

\*\* $p < .05$ .

\* $p < .1$ .

Source: own study.

Among the control variables, we find that audit fees are positively and significantly associated with audit opinion.

We estimated the early models on the entire sample of unbalanced data and the subsample of the balanced panel. With Hausman, we found that sample bias might be present in our dataset ( $\chi^2 = 717.46$  with  $p \ll .000$ ), thus the reported estimation is modified for the robust error and censored with the 1% and 99% sentiment quantile. The estimations on the balanced and unbalanced dataset show discrepancies in the significance of variables (e.g., lagged sentiment and audit opinion for industry control and the relation of loans to deposits in case of the year-controlled effects). In contrast, a full sentiment censored specification is consistent within the specific effects. We understood this rather in terms of the impact of mergers, acquisitions, failures and liquidations on the market than as the sample selection bias. The company during restructuring, close to acquisition, or at the edge of insolvency generates additional risk which impacts the pricing model as an auditor has the duty to present an opinion on the business continuance as a going concern. The time-controlled effects

**Table 6.** Auditors effects.

	<i>Base 0</i>	<i>Base L</i>	<i>CONT</i>	<i>CONT_CENT</i>	<i>CONT_BA</i>
BKD LLP			0.517*** (0.193)	0.519*** (0.192)	0.928*** (0.227)
Crowe Chizek & Company LLP			0.304*** (0.109)	0.315*** (0.110)	0.202** (0.094)
Crowe Horwath LLP			0.261*** (0.098)	0.268*** (0.099)	0.182* (0.104)
Ernst & Young LLP			0.402** (0.167)	0.400** (0.167)	<b>0.270</b> <b>(0.196)</b>
KPMG LLP			0.653*** (0.141)	0.650*** (0.142)	0.539*** (0.168)
McGladrey & Pullen LLP			0.387** (0.157)	0.387** (0.158)	0.493** (0.247)
Moss Adams LLP			0.659*** (0.167)	0.668*** (0.169)	0.791*** (0.218)
Other auditors			0.175** (0.081)	0.176** (0.083)	<b>0.129</b> <b>(0.099)</b>
PricewaterhouseCoopers LLP			0.534*** (0.184)	0.533*** (0.184)	0.459* (0.247)
Yount Hyde & Barbour PC			0.805** (0.409)	0.800* (0.408)	<b>0.610</b> <b>(0.480)</b>
Observations			2962	2932	1868
Banks			351	351	154
r2_w			0.182	0.181	0.184
r2_b			0.840	0.842	0.867
r2_o			0.787	0.789	0.774

Standard errors are in parentheses.

\*\*\* $p < .01$ .

\*\* $p < .05$ .

\* $p < .1$ .

Source: own study.

result in unexpected relations, namely the existence of a link between the audit fee and audit opinion types. If such a result would hold, it would indicate a compromise of auditor independence. This is contrary to previous academic research.

Our analysis is subject to the assumption that the price properly transfers nonfinancial information. As the audit market is clustered with the major companies and other small players, the existence of the quasi-oligopoly would impair the quality of the conclusion derived from our estimation. Thus, we analysed the individual effect of the major audit entities on the banking industry. Table 6 presents the 10 top tier audit companies individual effects.

All individual company effects are significant except for Yount Hyde & Barbour PC and Ernst & Young LLP for balanced panel data. The results indicate a substantial difference for major market players with their client's pricing strategies. Therefore, we conclude that the potential market concentration does not significantly impact the market pricing mechanism.

## 5. Robustness of results

### 5.1. Mean estimation bias

Due to the dependence of the results on the atypical values, we re-estimated the base model with an application of the quantile regression. We applied a robust standard error estimation for 25%, 50%, and 75%. Table 7 presents the estimation.

**Table 7.** Quantile regression results.

	Q50	Q25	Q75
SENTIMENT	0.052*** (0.015)	0.057*** (0.019)	0.023 (0.018)
AUDIT_OPINION	0.323*** (0.047)	0.228 (0.252)	0.172** (0.084)
SIZE	0.717*** (0.005)	0.700*** (0.007)	0.717*** (0.006)
ZSCORE	-0.022*** (0.003)	-0.021*** (0.003)	-0.028*** (0.002)
LOAN_DEPO	-0.134*** (0.048)	-0.091* (0.048)	-0.075 (0.053)
LLP	0.019*** (0.007)	0.018* (0.011)	0.017* (0.010)
Constant	-2.378*** (0.118)	-2.322*** (0.146)	-2.142*** (0.139)
Observations	3688	3688	3688
Pseudo R2	0.6091	0.5426	0.6548

Standard errors are in parentheses.

\*\*\* $p < .01$ .

\*\* $p < .05$ .

\* $p < .1$ .

Source: own study.

The quantile regression, in general, supports the statement that sentiment impacts the auditor fee. A closed look at the output, however, shows some discrepancies between Q75 and Q25, which indicate a relationship that is not necessarily purely linear. At the median level, the variables become significant, which supports the model equation. The differences in the upper and lower quantiles suggest non-linear effects. Finally, taking into account the quantile regression results, we considered our results (presented in Table 7) as stable and carried them forward to the discussion.

### 5.2. Omitted variables bias

To verify the potential omitted variable bias, we re-estimated the model with the application of the generalized method of moments (GMM) which was developed by Arellano and Bond (1991), enhanced by Arellano and Bover (1995) and further developed in Blundell and Bond (1998) (Table 8). The model is more robust in terms of the endogenous variable problem, however sensitive to specification and potential inconsistencies. The GMM estimator is valid subject to two conditions. Firstly, it requires that the overidentifying restrictions are valid. Secondly, it does not allow the presence of second-order serial correlation in the error term. Hansen test shows the overall validity of the instruments while Arellano and Bond's test verifies the presence of the second-order correlation.

## 6. Discussion

Our results enhance the perspective of agency and information asymmetry theory. The intermediary (audit firm) should limit the asymmetry of information between the stakeholders, particularly shareholders (the principal) and bank management (the agent) at the price of the audit fee. Our findings show that the intermediary itself

**Table 8.** GMM estimator results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BASE0	BASE1	CONT	CONT_CENT	CONT_BA	YEARS	YEARS_CENT	YEARS_BA
AUDIT_FEE	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
L.AUDIT_FEE	0.335*** (0.05)		0.287*** (0.05)	0.287*** (0.06)	0.400*** (0.08)	0.262*** (0.06)	0.267*** (0.06)	0.383*** (0.09)
L2.AUDIT_FEE		0.217** (0.09)						
SENTIMENT	0.037** (0.01)		0.049*** (0.01)	0.048*** (0.02)	0.047* (0.02)	0.054** (0.02)	0.053** (0.02)	0.024 (0.03)
AUDIT_OPINION	0.138** (0.07)		0.065 (0.08)	0.069 (0.09)	0.113 (0.16)	0.089 (0.09)	0.084 (0.09)	0.210 (0.13)
SIZE	0.476*** (0.04)		0.463*** (0.04)	0.468*** (0.04)	0.402*** (0.05)	0.449*** (0.04)	0.446*** (0.04)	0.410*** (0.05)
ZSCORE	-0.032*** (0.01)		-0.032*** (0.01)	-0.033*** (0.01)	-0.026*** (0.01)	-0.029*** (0.01)	-0.028*** (0.01)	-0.021*** (0.01)
LOAN_DEPO	-0.139 (0.09)		-0.149 (0.09)	-0.146 (0.10)	-0.101 (0.14)	-0.172 (0.11)	-0.162 (0.12)	-0.267 (0.21)
LLP	-0.006 (0.01)		-0.007 (0.01)	-0.009 (0.01)	-0.002 (0.01)	-0.001 (0.01)	-0.001 (0.01)	-0.000 (0.01)
L.SENTIMENT		0.022* (0.01)						
L.AUDIT_OPINION		0.103 (0.10)						
L.SIZE		0.577*** (0.07)						
L.ZSCORE		-0.034*** (0.01)						
L.LOAN_DEPO		-0.165 (0.12)						
L.LLP		-0.024* (0.01)						
Constant	-1.459*** (0.32)	-1.985*** (0.42)	-0.794* (0.46)	-0.909** (0.46)	-0.869** (0.43)	-0.154 (0.55)	-0.176 (0.53)	-0.672 (0.63)
Auditors FE	NO	NO	YES	YES	YES	NO	NO	NO
Subindustry FE	NO	NO	YES	NO	YES	YES	YES	YES
Years	NO	NO	NO	NO	NO	YES	YES	YES
N	3525	3434	3525	3491	2065	3525	3491	2065
# Banks	394	386	394	394	154	394	394	154
AR1	-4.551	-4.044	-4.293	-4.272	-3.636	-4.162	-4.134	-3.503
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2	1.116	-2.416	0.800	0.733	2.099	0.836	0.805	2.191
AR2 p-value	0.264	0.016	0.424	0.463	0.036	0.403	0.421	0.028
Sargan test	571.662	954.634	537.264	535.910	467.654	483.913	482.562	417.218
Sargan p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	338.223	313.607	324.602	331.359	142.097	318.549	321.645	114.278
Hansen p-value	0.532	0.621	0.527	0.422	1.000	0.357	0.313	1.000

SE statistics in parentheses.

\* $p < .10$ .\*\* $p < .05$ .\*\*\* $p < .01$ .

Data set 2000–2016. Notes: This table presents the results of the model Eq.2, estimated via a twostep GMM system estimator developed by Blundell & Bond, 1998.

In all instances, sentiments positively affected the total audit fee.

Source: own study.

brings the additional noise to the information asymmetry, by allowing the agent for sentiment differentiation in respect of the communication with the principal.

Irrespective of the estimation methods and model applied, there exist a positive relation between the auditor fee and the positive sentiment. From this perspective, our study contradicts Bicudo de Castro et al. (2019) in respect of the banking sector and high-risk economy. This relation is, however, unstable in terms of time effects. The Bicudo de Castro et al. study was based on the OLS regression, without the



correction of the potential endogeneity of the sentiment and auditor fee on the unlagged level, in addition, a time-corrected model resulted in an insignificant relation between auditor fee and sentiment. This, in fact, brings us to the observation that the sentiment effects might be unstable across time and geographical areas. Our research supports the prior suspicions that in contrast to industrial entities, bank auditors are subordinated to regulatory inspection and the litigation risks from their shareholders and the government. And the evidence that the audit fee responds significantly to the sentiment of the tone in 10-K form is not consistent with Hypothesis 1 that banks that provide positive sentiment in annual reports are associated with lower audit fees than those with negative.

After the Global Financial Crisis, audit firms were under pressure from banks to slow audit fees during the crisis. In addition, regulators were disturbed that minor audit fees could finish in a lower audit effort and quality. However, we have observed a continuous growth of positive sentiment since 2000, except for 2009. A combination of trends, visible on Graph 1, and the instability of the results in terms of yearly effects indicates that sentiment might be driven by the status of the general economy more than by conscientious auditor behaviour. Even if the auditor remuneration model suffers inherent limitations (Morawska & Staszkievicz, 2016), the significant and different individual auditor's effects in regression contradict the risk of an adverse impact of concentration on market pricing mechanisms. Our results indicate that the audit fees of the BigN companies react less to sentiment than other audit firms and as such the reaction is not significant almost in all possible specifications. Furthermore, a large risk understatement may attract unwanted auditor attention. At the same time, BigN auditors may reject clients as unreasonable litigation risks. As the overall control between tier one and the rest of the companies is insignificant across different specification of models, we confirm our Hypothesis 2 that there is a uniform pricing policy for banks across major audit service providers.

The proposed model does deal with the total fee, in contrast to the split of the audit fee and non-audit fee. Previous research has shown that the audit fee and non-audit fee might be jointly determined (Hay et al., 2006). In our study, on the sentiment of annual reports is based on the high-litigation environment of the US. Given that litigation risk impacts corporate reporting behaviour in non-random ways (Rogers et al., 2011), the results of this study should be applied with caution to other less risk-seeking environments. Our sample is of a different nature than the one applied by Gandhi (Gandhi et al., 2019). We commenced the dataset at 2000 due to the availability of the audit fee data. We did not censor the banking industry only to banks, allowing for the Commercial Banking, offices of Bank Holding Companies, and Savings Institutions to be represented in our approach. This allows us to enhance the perspective of the current study. In addition to Gandhi et al. (2019), we applied the ZSCORE as a risk variable as we are unable to justify the control of the efficiency of the financial market during the downturn of the economy. And even considering those limitations, our study supports Gandhi et al. (2019) on the potential impact of sentiment to various financial aspects of corporate governance. Some inherent limitation limits our ability to generalise the findings. Firstly, we examined the US market setting. The EU applies a different institutional (e.g., wider application of the Basel

Accords through the system) framework. Our dataset refers to the period before the introduction of the long-term audit reporting requirements, thus it does not capture the impact of key audit matters on the sentiment of the financial statements. We applied the ZSCORE as a more uniformed measurement of banking risk, while supervisors rely on the onsite examination and capital requirements monitoring.

Despite the objectivity of the methodology applied, the present work faces some limitations. While sentiment analysis is useful, it is not a complete replacement for reading. The meaning of the text is often ambiguous and depends substantively on the context of the sentence, the type of document, time of writing, or the author. Automated sentiment extraction often fails at details such as irony, humor, or sarcasm. Furthermore, the regression results could be influenced by other filing form types or disclosures made by a particular company in our data sample. We made an effort to mitigate those risks by sampling from a relatively homogenous population of banks operating in a uniform legal and geographical environment, however, those limitations can not be fully mitigated.

Our findings have implications for policy setters and investors. The investors, to be efficient, might score bank sentiment and auditor remuneration as indicators for potential investment opportunities. For financial supervision authorities, the results of this study might contribute to the additional filter design while taking decisions for on-site examination of supervised entities. This observation might be important to the transition's economy, where the ability to extract sentiment from reporting is limited due to paper-based filing requirements.

## 7. Conclusions

The importance of auditing as a corporate governance mechanism is a subject of considerable research interest. In general, tone addresses the extent to which banks' annual reports contain words with pessimistic or optimistic overtones. It is therefore measured as the frequency of positive words minus the frequency of negative words used in the report. This paper explores whether the positive sentiment in annual reports is associated with lower audit fees in the banking sector. Therefore, with this study, we ask whether the corporate communication sentiment impacts the audit fee. To address this aim, we generate a unique dataset of annual report tone for 490 US banks for the period 2000–2016. We employed textual analysis most widely used to transform the narrative into a numeric value that represents the sentiment tone - "positive" versus "negative" words. We applied panel instrumental regression using: audit fee as the explanatory variable, sentiment and several bank risk measures as regressors. We identified the dichotomy in risk attitude. Sentiment of messages reflected in annual reports is positively related to audit fees, indicating that a greater proportion of positive tone messages requires more attention from auditors. Furthermore, the audit charge valuation is not forced only by internal banking determinants. The macroeconomic factors of the country and the level of the complexity of activities and regulation are taken into consideration by auditors.

Our study advances the bank governance discussed in several ways. Firstly, it provides robust evidence of the impact of reporting sentiment on the auditors' fees.

Secondly, our proposal provides us to spread the general audit fee model into a very rich formal setting, which are banks. Therefore, our paper should be helpful to accounting companies, which rate their litigation exposition in this high-risk sector. Thirdly, we confirmed the uniform pricing policy across major audit service providers. Fourthly, we provide robust evidence of the positive and significant relationship between sentiment and audit fee for further research.

We expect the results of this survey will be of interest to auditors, investors, creditors, and regulators, given the main role that financial report sentiment plays in pricing and negotiating agreements.

The study results indicate potential areas for further research. We are unaware of the interaction between the auditor and management sentiment impact on the audit fee. We hope to be able to address this issue in the future.

## Note

1. <https://sraf.nd.edu/>.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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