

Do auditors reflect the true image of the company contrary to the clients' interests? An artificial intelligence approach

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Do auditors reflect the true image of the company contrary to the clients' interests? An artificial intelligence approach

Abstract

In recent years, as a result of various scandals, the role of auditors has been called into question, even casting doubt on whether their reports reliably reflect the true financial situation of the auditee, especially when this situation is not good. Normative changes in the way auditors have to rate certain questions provide a good opportunity to study this problem, having acquired great relevance among the factors involved in studying audit quality. Thus, the present study analyzed the effect of the normative change that took place in Spain in December 2010 related to opinions modified for going-concern uncertainties. Until that date, the auditor's uncertainty about the company's going concern status led to a qualified opinion. However, under the new regulation, it became an opinion that included an explanatory paragraph stating the reasons for concern, which was considered less serious. In all, 152 small and medium-sized enterprises (SME) that had begun bankruptcy proceedings were studied. Expert systems were used for their analysis, based on classification trees assembled through boosting and bagging. In addition, the logistic regression was used as a baseline to compare the previous methods. The main result obtained was that a change in the norm that catalogues the going concern issue as less serious made auditors more likely to report this situation, thus questioning the audit quality.

Key words

Reliable image, audit quality, normative changes, classification trees, boosting, bagging

Introduction

The result of an audit has to be a report that tells whether the information obtained about the organization's financial situation is reliable or not. Thus, the auditor must detect whether there are errors or omissions, voluntary or not, in these financial statements. However, can the quality of these reports be conditioned by the fact that the company hires the auditor? Undoubtedly, this is a topic that combines a high level of interest and great research complexity, given that it is difficult to know whether an auditor is doing his/her job well without carefully evaluating all of the company's financial information. In this case, normative changes that modify the way certain situations should be rated, by considering them to be more or less serious, provide a good opportunity to study the aforementioned problem.

For this reason, regulatory changes and their effects on the auditor's behavior have acquired great importance among the factors considered in studying audit quality, and many previous studies have been developed under this paradigm. For example, in the United States, various studies have analyzed the effect of the Sarbanes-Oxley (SOX) Law on the auditor (eg. DeFond & Lennox, 2011; Fargher & Jiang, 2008; Geiger et al., 2005; Gramling et al., 2011; Li, 2009; Sercu et al., 2006); in Australia, the consequences that accompanied the increase in regulatory pressure stemming from the financial crisis have been examined (Xu et al., 2013); and in China, the repercussions of the Bankruptcy Auditor Law passed in 2006 have been studied (Mo et al., 2015). All these cases show that changes in the standards present an interesting milestone to test the auditor's behavior and more closely examine the concept of audit quality.

Although audit quality has been discussed for many years, it is still a difficult concept to pin down, due to the different perspectives from which it can be approached. Thus, most studies carried out in this field have focused on factors that can be used to measure audit quality, especially the going concern opinion and its relationship with the economic-financial reality of the company (Carcello et al., 1995, 1997; Chen & Church, 1992; Francis & Krishnan, 2002; Geiger et al., 2005; Hopwood et al., 1994; Mo et al., 2015; Raghunandan & Rama, 1995; Xu et al., 2013).

The present study aims to contribute further knowledge about this problem in an understudied area like the European Union and, more specifically, in Spain, thus accepting the challenge presented by Mo et al., (2015). These authors insist that there is an urgent need to better understand the auditor's decision to render a going concern report

about the company's situation, beyond the United States and other Anglo-Saxon economies. In addition, the study is carried out in a type of firm that has hardly been studied in this area, small and medium-sized enterprises (SMEs), using the artificial intelligence technique of regression trees for this purpose. This strategy agrees with Omoteso (2012), who stated that the future of the application of artificial intelligence to the auditing field should focus, among other things, on SMEs and the auditor's independence. SMEs represent 99% of all the companies in Europe and approximately two-thirds of the total billing and employment. In the USA, SME provide approximately 75% of the net jobs added to the economy (Altman and Sabato 2007). However, the importance of this kind of company in the global economic context contrasts with its high level of business failure. For these reasons, it is relevant to study everything that has to do with this failure, directly or indirectly. In recent years, a large body of literature has tried to identify the factors that lead to failure in SMEs (Bates 2005; Lechner and Dowling 2003; Mata and Portugal 2002), or to find a model for predicting the risk of bankruptcy in order to avoid its consequences (Altman and Sabato 2007; Altman et al. 2010). Finally, according to Ireland (2003), the size of the company can condition the auditor's independence, demonstrating that company size has a contrary effect when receiving a modified report about going concern.

In the area addressed in this study, most studies have related the effect of the normative change and the modification in the auditor's attitude in large traded companies (Geiger et al. 2005; Fargher and Jiang 2008; Li 2009; Mo et al. 2015; Sercu et al. 2006; Xu et al. 2013). One of the main reasons may be that, according to Arnedo et al. (2008), in SMEs it is more difficult to obtain information. This is combined with a lack of clarity about their financial states, the manipulation of the income figures when there are continuity problems, and the difficulty of interpreting auditory reports.

At the European level, the need for greater harmonization of the audit gave rise to a reform process that led to passing Directive 2006/43/CE of the European Parliament and Council on May 17, 2006. This new Directive was an important step in achieving greater consistency in the requirements for practicing the auditor's activity in the area of the European Union, with one of its objectives being the requirement of applying the International Auditory Norms adopted by the European Union.

Under this regulatory framework, the International Federation of Accountants had emitted International Auditory Norms 700, 705 and 706, which affected the auditory

reports carried out from 2010 on, with Spain being obligated to adapt to these norms. Thus, the Institute of Accounting and Accounts Auditing, as the Spanish organism in charge of adapted the International Norms, in matters of both accounting and auditing, emitted the Resolution of December 21, 2010. Its main aspects produced a model for a new auditory report that converged with the model adopted in the European Union.

Among the most important aspects of this new norm, we can highlight those related to circumstances that produce going concerns, including those that can affect the future viability of the company or principle of a functioning company. Based on this new norm, these circumstances must be reflected through a highlighted paragraph and no longer affect the auditor's opinion. With the previous normative, the auditor had to warn about this going concern about the company through a report with a modified opinion.

This very relevant question is the fundamental proposal in the present study. This study tries to verify whether the auditor has a greater tendency to report on the danger of the company's continuity when doing so through a highlighted paragraph than through a modified opinion, which is considered more serious from the point of view of the user of the information. The importance of this question becomes clear in the large number of academic studies showing that a modified opinion due to going concern about the continued management of the company can produce a loss of the client (Carcello and Neal 2003; Chan et al. 2006; Geiger et al. 1998; Lennox 2000; Vanstraelen 2003) or accelerate the bankruptcy process in smaller clients (Arnedo et al. 2008; Gaeremynck and Willekens 2003; Pryor and Terza 2002; Vanstraelen 2003).

In this regard, our study joins the scarce literature on the role of audit reports in SMEs and, more specifically, the causes that lead an auditor to emit a going-concern opinion in a type of firm that is much more sensitive to this type of opinion due to its strong dependence on external financing.

The present study shows that auditors are hesitant to issue a going concern report to the firm when the law catalogues these types of problems as serious. However, with a regulation that reduces this seriousness, auditors are more likely to give a going-concern opinion.

Finally, the document is structured in seven sections. After this introduction, section two is dedicated to reflecting on the concept of the audit and the way to measure this concept. Sections three and four focus, respectively, on the literature review about the influence of

regulations on audit quality in small and medium-sized enterprises. Section five presents the methodology used to elaborate the study. Finally, sections six and seven present the analysis of the results and the conclusions.

The quality audit concept

A large variety of reasons can lead management to manipulate accounting data to meet or exceed the reference points for earnings. Graham et al., (2005) summarize them as: (i) building credibility with the capital market; (ii) maintaining or increasing the price of the shares; (iii) improving the external reputation of the management team; and (iv) transmitting perspectives for future growth.

The existence of opportunistic behavior on the part of management and the different methods they use in accounting manipulation, as well as the growing complexity of commercial transactions and accounting regulations, adds value to the audit. It can offer an independent guarantee of the credibility of the accounting information, improving resource assignment and hiring efficiency through investments. Therefore, the role of the audit is vital in increasing the value of financial reports and has the purpose of reducing information asymmetries (Boone, et al., 2010).

However, it seems evident that, in order for the audit to achieve its objective, it must be carried out with some quality parameters in mind, so that the auditor's opinion about the truthfulness of the financial states reviewed efficaciously meets the expectations of the users of the information. However, although the literature has spent more than two decades investigating this term, it is not easy to find a specific definition for what audit quality means and, even less, how to measure it. In this regard, Knechel et al., (2013) point out that the main reason could be the different perceptions of this concept, influencing the type of indicators used to evaluate it.

For Deangelo, (1981), audit quality is determined by the joint probability that the auditor detects infractions in the client's accounting and, in addition, communicates these infractions. This definition identifies the two important components of audit quality that form the basis of the majority of the studies in this area. On the one hand, the discovery of accounting errors is directly related to the competences and efforts of the auditor, and, on the other, the auditor's intention to report the errors found is clearly linked to the characteristics of objectivity and independence that the auditor must have. Thus, most

definitions of audit quality refer to it as a binary process where auditors either fail or are successful in detecting errors in the accounting principles and criteria. DeFond & Zhang, (2014) go one step further and argue that the auditor's responsibility is much more extensive than the mere detection of these errors. They suggest that audit quality is a continuous construction that guarantees the quality of the financial information by increasing the credibility of the financial reports.

In addition, Francis (2011) argues that audit quality is a complex concept and cannot be reduced to a simple definition, so that this author focuses on distinguishing low quality audits from high quality audits. In this regard, the low quality audit is related to the presence of errors due to the auditor's lack of independence, or to the incorrect emission of reports as a result of poor professional practices. By contrast, a good auditor competently complies with the auditing standards and, furthermore, issues a correct opinion with regard to the client's financial states and the company's circumstances.

Thus, the accuracy of audit reports is normally seen as a sign of high quality, with increasing relevance given to empirical studies that relate companies' financial situation to the accuracy of the auditor's previous reports about this situation (Geiger et al., 2005; Mo et al., 2015).

More specifically, studies focused on the going concern of the company make it possible to evaluate the audit quality, so that the probability of issuing a going concern report, depending on the financial situation of the client, is used to measure the auditor's independence (Francis, 2011). The premise of this type of study establishes that the less independent auditor will be less likely to issue a going concern modified opinion to the company, as this could lead to the loss of the client (Krishnan, 1994).

Geiger et al. (2005) identify two types of errors in determining a quality audit: the first type occurs when a company receives a modified going concern report, but maintains its viability. The second type occurs when a company enters into bankruptcy, but did not receive a modified opinion in the previous exercise warning of the danger of going concern. Although there are costs associated with both types of errors, clients, legislators and other users of financial statements give greater importance to type 2 errors (Geiger et al., 2005). Various studies have analyzed this question, obtaining the result that less than half of the companies that enter into bankruptcy receive a modified going concern opinion (eg. Carcello et al., 1995, 1997; Chen & Church, 1992; Hopwood et al., 1994; Raghunandan & Rama, 1995).

In addition, it seems obvious that the users of financial information expect that before a company enters into bankruptcy, there will be some type of warning about what can occur. However, many studies have shown that the auditors are more likely to be fired the year after issuing a modified opinion (Carcello & Neal, 2003; Chan et al., 2006; Gómez-Aguilar & Ruiz-Barbadillo, 2003; Lennox, 2000; Segura, 2003; Vanstraelen, 2003), which empirically shows the serious threat of this type of opinion for the auditor.

Unfortunately, in recent years we have become accustomed to the fact that the majority of regulation modifications have been preceded by the detection of serious business scandals where the clear connivance between auditors and management are shown, putting in doubt one of the basic pillars of the auditor's profession, independence. However, the regulation changes that can occur in a certain environment is a good opportunity to increase the empirical evidence about the audit quality (Xu et al., 2013).

One of the normative changes that has transcended the most worldwide was the enactment of the SOX in the United States in 2002 after the Enron case. This change was made with the clear intention of improving the system's capacity to prevent, detect, and, if necessary, report large-scale business frauds, definitively, to reestablish the reliability of financial information. Thus, the greater demands of this Law have had a noteworthy effect on the situation of auditors, allowing them to express an opinion that can improve their reputation, avoid responsibilities in cases of lawsuits, and be proactive in reducing government intervention (Geiger et al., 2005). In this regard, various studies have shown that auditors are more likely to issue an opinion that warns of going concern danger after the enactment of the SOX Law (Fargher & Jiang, 2008; Geiger et al., 2005; Gramling, A.A.; Krishnam, J.; Zhang, 2011; Sercu et al., 2006). In addition, in the study of this regulation change, a positive relationship has been observed between the auditor's fees and the willingness to give a going concern opinion (Li, 2009) and, as a result of the strong sanctions established in the Law, a greater tendency for smaller or lower quality auditors to leave the market (DeFond & Lennox, 2011).

In Australia, the financial crisis period caused the regulatory pressure to increase with the auditory norms ASA 701 (AUASB, 2007b) and ASA 570 (AUASB, 2007a). These norms caused auditors to feel pressured to detect the financial difficulties of these clients before bankruptcy, as they face serious fines if they do not communicate this situation. In this regard, Xu et al., (2013) found that auditors, after the new auditory norms were passed,

showed a greater tendency to issue a going concern report to the company, basically to avoid the greater risk of lawsuits and the resulting loss of reputation.

In addition, Mo et al., (2015) analyzed the effects of the Concursal Law passed in China in 2006 on the auditor's opinion. This Law did not directly change the legal responsibility of the auditor, but it did increase the possibility of publicly traded companies declaring bankruptcy, most of which were in the hands of the Chinese government. Their study reveals a clear difference in the attitude of local auditors and that of large auditory firms (Big 4). Thus, the large auditory firms did not present any variations compared to the previous period, even though the legal environment was underdeveloped and the possible costs of lawsuits were quite low. However, the local auditors showed a greater tendency to issue a going concern opinion after the enactment of the new Law.

In Europe, although fewer, there are studies like the one by Carcello et al. (2009), which relates the normative changes in Belgium to rule-based auditory standards. Until the year 2000, the auditor had complete discretion to report going concern to the company. However, from that date on, a new auditory norm was established that affected financially stressed companies. According to this norm, the board of directors is obligated to communicate the going concern of the company, and the auditor has to supervise and issue a report based on this information. The authors' main conclusions pointed out an increase in Type I errors (incorrect ongoing management) and a reduction in Type II errors (incorrect clean opinions), showing the need for better regulation to avoid the auditor's discretion. Thus, the cited cases show that regulatory changes that occur in a country are decisive in pressuring auditors to accurately report going concern to companies.

In the case of Spain, until the recent passing of the International Accounting Norms in 2013, and the enactment of the new Auditory Law in 2015, which imposes greater restrictions on auditors that increase their independence, no important regulation changes had occurred. It seems obvious that it is still very soon to evaluate the effect of these regulation changes on the attitude of auditors; however, in Spain some less important regulation changes have been made that have had great transcendence in the context under study. These less important modifications in regulations offer a great opportunity to evaluate the auditor's behavior regarding these changes, as occurred in the United States with the SAS n°34 and SAS n° 59 norms (eg. Carcello et al., 1995, 1997; Raghunandan & Rama, 1995).

Focusing on the case of Spain, one of the most relevant studies carried out about a regulation change is the one by Ruiz-Barbadillo et al., (2009). It analyzes the effect on the audit quality of overturning the obligatory rotation of auditors. The main conclusion extracted from the study is that the obligatory abolition increases the probability that the auditor will issue modified going concern opinions.

The present study focused on the regulation change that occurred on December 21st2010. Until that time, the auditor who showed serious financial problems in the company was obligated to issue a modified going concern opinion. However, the December 21st2010 resolution by the Institute of Accounts Auditing and Accounting, in order to harmonize the accounts auditing activity in Spain with the international auditing norms, considered this situation as a highlighted paragraph in a modified opinion, which is considered less serious than the situation prior to this date.

This differentiation is relevant because, as Mo et al., (2015) stated, a modified going concern opinion does not have the same repercussions for the auditor or for the users of the accounting information as a highlighted paragraph in a modified opinion.

The audit and the SME

It is curious to observe that, even though SMEs represent 99% of all the companies in Europe and approximately two-thirds of the total billing and employment, the majority of the empirical studies on audit quality have focused on publicly traded companies (eg. Chan et al., 2006; Defond et al., 2002; Mo et al., 2015; Sercu et al., 2006; Xu et al., 2013).

One of the main factors conditioning the development of these types of studies in SMEs is directly related to the companies' dimensions; in most European countries, only companies of a certain size have to be audited. In addition, it is difficult to obtain information about these types of companies, their financial situations are not clear, their income figures may be manipulated when there are going concern problems, and it can be difficult to interpret the audit reports (Arnedo et al., 2008).

It is also important to take into account the great economic effort made by small companies in contracting auditing services (Chung & Narasimhan, 2001). This means that small companies are less likely to perform voluntary audits, especially if the shareholders and managers are the same people (Tauringana & Clarke, 2000).

In spite of all this, it can be interesting for these types of companies to use auditing services because they can provide solutions such as resolving internal problems of agency, improving the efficiency of processes, and guaranteeing the fulfillment of complex regulations (Knechel et al., 2008). Moreover, according to Devi & Samujh, (2010), audits in SMEs can also make it possible to improve business coaching and help with applying for subsidies, strategic planning, internal controls, corporate liquidation or recovery and internal audits.

It seems evident, therefore, that auditing services can provide key aspects in the management of SMEs, such as greater control over records and systems and improving the credibility of the financial states. These services can undoubtedly explain why many companies that, due to their size, do not have to be audited, contract the services of an external auditor (Chung & Narasimhan, 2001; Collis, 2008; Senkow et al., 2001). Thus, all of these types of contributions are usually perceived by these types of companies as even more valuable than those provided by financial entities (Boter & Lundström, 2005).

However, it should be taken into account that one of the main characteristics of SMEs stems from structural weaknesses intrinsic to their size, which means that their main financing source is, almost exclusively, financial entities. For this reason, these companies are afraid of receiving a going concern opinion because this could make it more difficult to access new credit, thus accelerating the bankruptcy process.

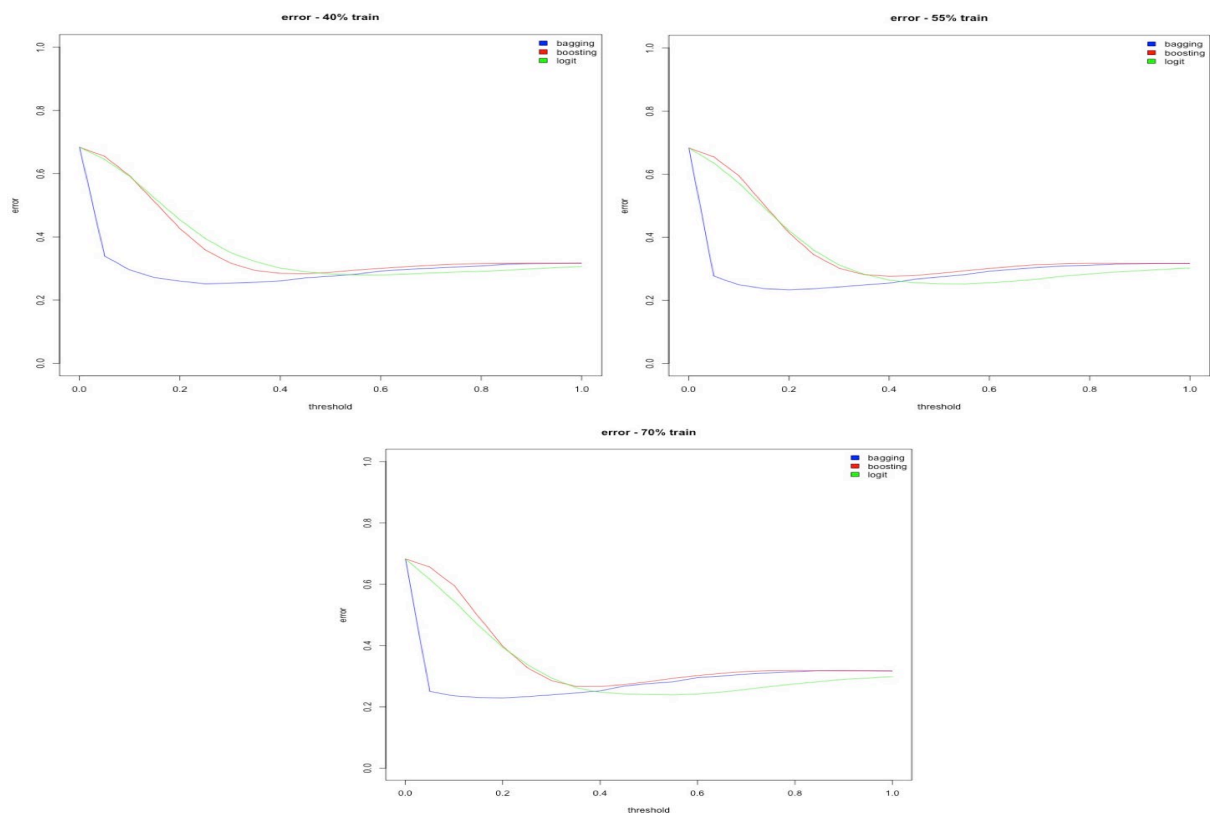
This situation, referred to in the literature as a “self-fulfilling prophecy”, has been debated in some studies whose main conclusions show a positive association between auditors’ going concern opinions and bankruptcy. Thus, there is a greater probability that a company will enter into bankruptcy or see its financial situation worsened after receiving a going concern opinion than if it had not received this opinion (Arnedo et al., 2003; Geiger et al., 1998; Pryor & Terza, 2002; Vanstraelen, 2003).

One of the most important aspects of the norm under study in this paper is that the circumstances that can affect the principle of a functioning company must be reflected through a highlighted paragraph and no longer affect the auditor’s opinion. This situation does less damage to the company because a modified opinion for this reason can cause, as indicated above, problems for the clients, even managing to accelerate the bankruptcy process in smaller companies (Arnedo et al. 2008; Gaeremynck and Willekens 2003; Geiger et al. 1998; Pryor and Terza 2002; Vanstraelen 2003). In companies that enter into bankruptcy do not receive a modified going-concern opinion (e.g., Carcello et al.

1995, 1997; Chen and Church 1992; Hopwood et al. 1994; Raghunandan and Rama 1995). This latter circumstance could be due to the auditors' intention to avoid harming their clients, which, among other questions, can lead to the loss of the client (Carcello and Neal 2003; Chan et al. 2006; Geiger et al. 1998; Lennox 2000; Vanstraelen 2003). With all this in mind the following hypothesis formulated:

H1 Auditors are less likely to report on going concern when this can imply a serious problem for the company (modified report) than when this problem has less transcendence for the company (highlighted paragraph).

Figure 1. Total error of the models used



Methodology

Variables used

For the empirical application, a set of variables from the academic literature were used to find out whether auditors have a greater propensity to give going concern opinions in the period after the normative change compared to the period before this change.

We identified going concern opinions as the dependent variable, with a value of 1 assigned if the auditors communicate going concern to the company (whether as a proviso or as a highlighted paragraph) and 0 in the opposite case. The period of time (YEAR), before or after December 2010, is the explanatory variable being studied, and has been used previously in studies like those by Carcello et al., (1997); Geiger et al., (2005) and Raghunandan and Rama (1995). If this variable were relevant, it would mean that the normative change under study affected the auditor's opinion.

Furthermore, as in other previous studies in this field (eg. Fargher & Jiang 2008; Geiger et al., 2005; Gramling et al., 2011; Sercu et al., 2006; Mo et al., 2015; Xu et al., 2013), the following variables were included in the study: the probability of bankruptcy (Z), the size of the company (LTA), the current ratio (CURAT), the short-term debt (ENCP), the proportion between the sum of the stocks and collection rights for total assets (ARAT), the sector where the company operates (SECTOR), and the result of the exercise (RDO). The Z variable (ZSCORE) reflects the probability of bankruptcy measured by Altman, (1983). LTA includes the logarithm of the total assets, which makes it possible to determine the influence of the size of the client. CURAT is determined by the quotient between the current assets and the current passives. ENDCP, or the short-term debt ratio, reflects the quotient between the current passives and the total passives. ARAT is the proportion between the sum of the stocks and the rights and the total assets. The SECTOR variable adopts a value of 1 if the company develops an industrial activity and 0 otherwise (commercial or services). Finally, the RDO variable will have a value of 1 if the company has incurred losses, and 0 in the opposite case.

It should be pointed out that, although the size of the auditor is a widely-used variable in this type of studies (eg. Barnes, 2008; Boone et al., 2010; Choi et al., 2008; Dechow et al., 2010; Francis, 2004; Knechel et al., 2008; Krishnan et al., 2000; Mo et al., 2015), in our case it was not possible to include the auditor size in the study because most of the

companies analyzed hired small local firms, which means that no comparisons could be made in this regard.

Table 1. Total error of the models used

Table1 Totalerrorofthemodelsused

Threshold0.0000.0500.1000.1500.2000.2500.3000.3500.4000.4500.5000.5500.6000.6500.7000.7500.8000.8500.9000.950

Train:70%
Bagging0.6830.2500.2360.2300.2280.2330.2390.2450.2520.2680.2750.2810.2950.3000.3070.3110.3150.3180.3180.318
Boosting0.6830.6550.5960.4940.3980.3280.2850.2660.2660.2720.2820.2930.3020.3100.3150.3180.3190.3180.3170.317
Logit0.6830.6160.5450.4660.3940.3380.2940.2620.2480.2420.2400.2390.2420.2480.2570.2660.2740.2820.2890.294
Train:55%
Bagging0.6830.2770.2490.2370.2330.2370.2420.2480.2540.2670.2740.2810.2920.2990.3050.3090.3110.3150.3150.317
Boosting0.6830.6540.5950.5030.4140.3440.3020.2810.2760.2780.2860.2940.3010.3070.3130.3160.3170.3170.3170.317
Logit0.6830.6350.5720.4940.4210.3580.3120.2830.2640.2560.2520.2520.2560.2610.2680.2770.2830.2900.2940.299
Train:40%
Bagging0.6840.3390.2950.2710.2600.2510.2530.2560.2600.2700.2760.2820.2910.2970.3010.3050.3080.3130.3150.316
Boosting0.6840.6550.5930.5100.4260.3590.3170.2930.2840.2830.2880.2950.3000.3060.3100.3140.3150.3160.3170.316
Logit0.6840.6450.5910.5220.4540.3950.3500.3220.3010.2890.2820.2800.2790.2820.2850.2890.2910.2940.2990.303

Data and sample selection

As mentioned above, one of the main problems of working with small companies is the difficulty in obtaining the information with which to elaborate the databases. In the case of the present study, we used the SABI-System of Analysis of Iberian Balance database (Bureau Van Dijk, 2016). The following selection criteria were applied to obtain the final sample: Spanish companies that entered into bankruptcy or insolvency proceedings in Spain during the 2008–2013 period, were not traded companies, and had received some type of auditor's opinion between 2006 and 2012 in any of its modalities (favorable opinion, with going concern, unfavorable, or denied). After this first selection, we extracted only those companies that presented audit reports in the two years prior to entering into bankruptcy proceedings, yielding a total of 152 companies, of which 39 are micro-firms, 58 are small companies, 50 are medium-sized companies, and 5 are large firms. As mentioned above, we also included in the study the year when the normative change took place, the year before, and the year after. Thus, the intention was to test whether the auditors were more likely to issue a going concern report to the company when this report went from being a modified opinion to being a highlighted paragraph in a modified opinion.

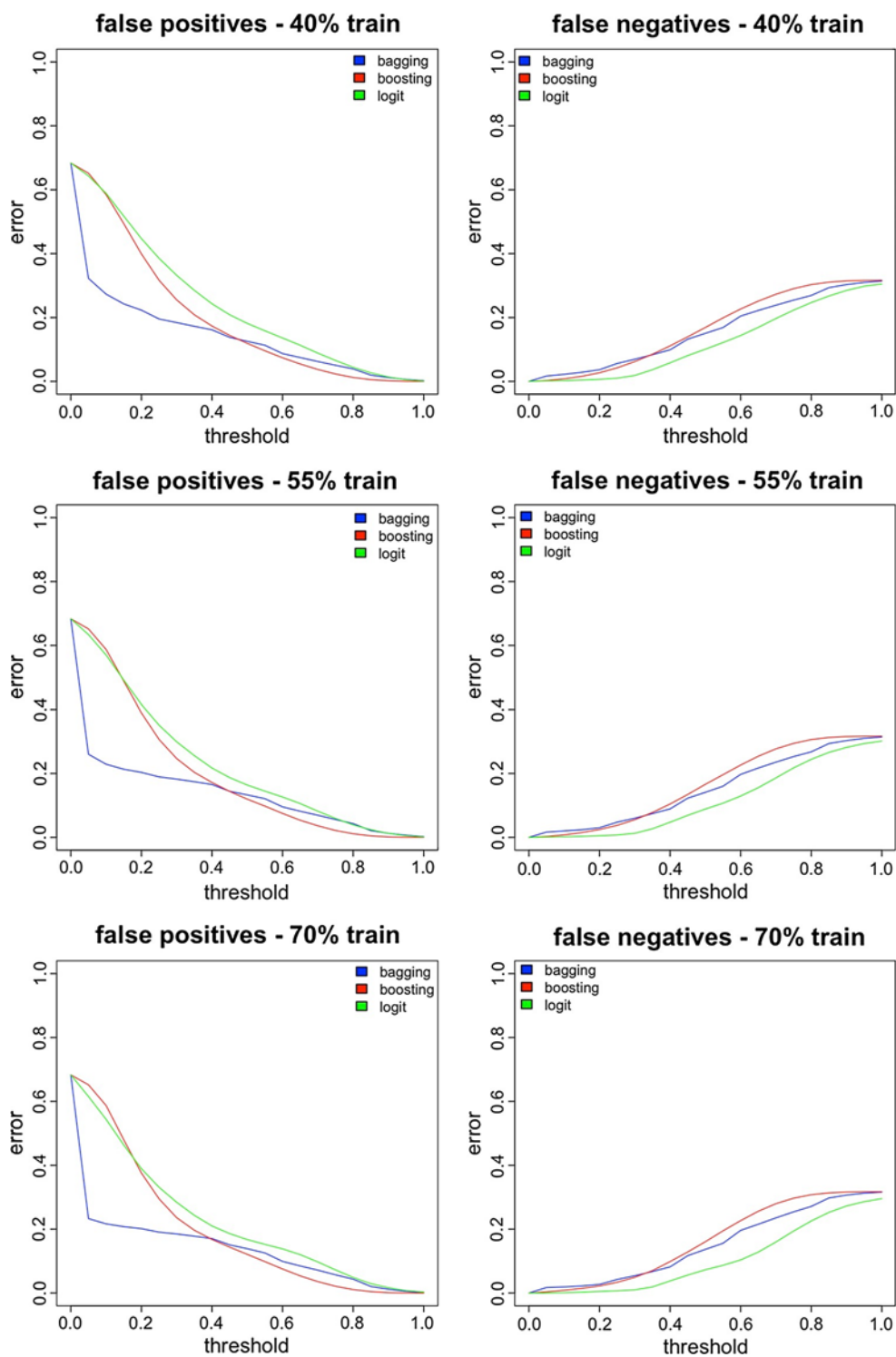
Once the sample had been obtained, it was necessary to identify whether the auditor expressed a going concern modified opinion to the firm, or whether the auditor somehow warned about the possible insolvency of the company in the two years before entering bankruptcy proceedings.

Analysis of the results

Artificial intelligence methods have been used to analyze the data, specifically classification trees with boosting and bagging (Bauer & Kohavi, 1999; Dietterich, 2000; Galaret al., 2012; Kotsiantis, 2007). Classification and regression trees are one of the most intuitive and transparent classification algorithms compared to other learning techniques (King *et al.*, 2015), representing a powerful alternative to more traditional statistical models (Chrzanowska *et al.*, 2009). According to Homaie-Shandizi *et al.*, (2016), these techniques were presented by Morgan and Sonquist, (1963) in the 1960s, and two decades later, Breiman, Friedman *et al.*, (1984) developed the first modern and exhaustive algorithm. In the tree structure, the leaves represent the classifications, and the branches

represent the sets of characteristics that lead to the categories mentioned (Chrzanowska et al., 2009; Tsai & Chiou, 2009). Their purpose is to make a recursive division of the training data into homogenous subsets. Thus, the diversity of members within each new partition has to be reduced as much as possible (Shmueli et al., 2010). Decision trees require few assumptions about the model, no knowledge of the domain, and minimal parameters, making the technique flexible and attractive for numerous business applications (King et al., 2015). In addition, they have the advantage of being capable of detecting non-linear relationships and showing good performance when there is qualitative information (Chrzanowska et al., 2009). The software used was the Adabag R package (Alfaro et al., 2013), which implements the aforementioned types of assemblage.

Figure 2. False positives, false negatives, specificity and sensitivity



As a baseline to evaluate the performance of the trees, logistic regression was used. Logistic regression is a commonly used statistical tool for classification problems (Blanco Oliver et al. 2012; Liu et al. 2014). This regression was also used to test the proposed hypothesis.

Figure 3. Specificity and sensitivity

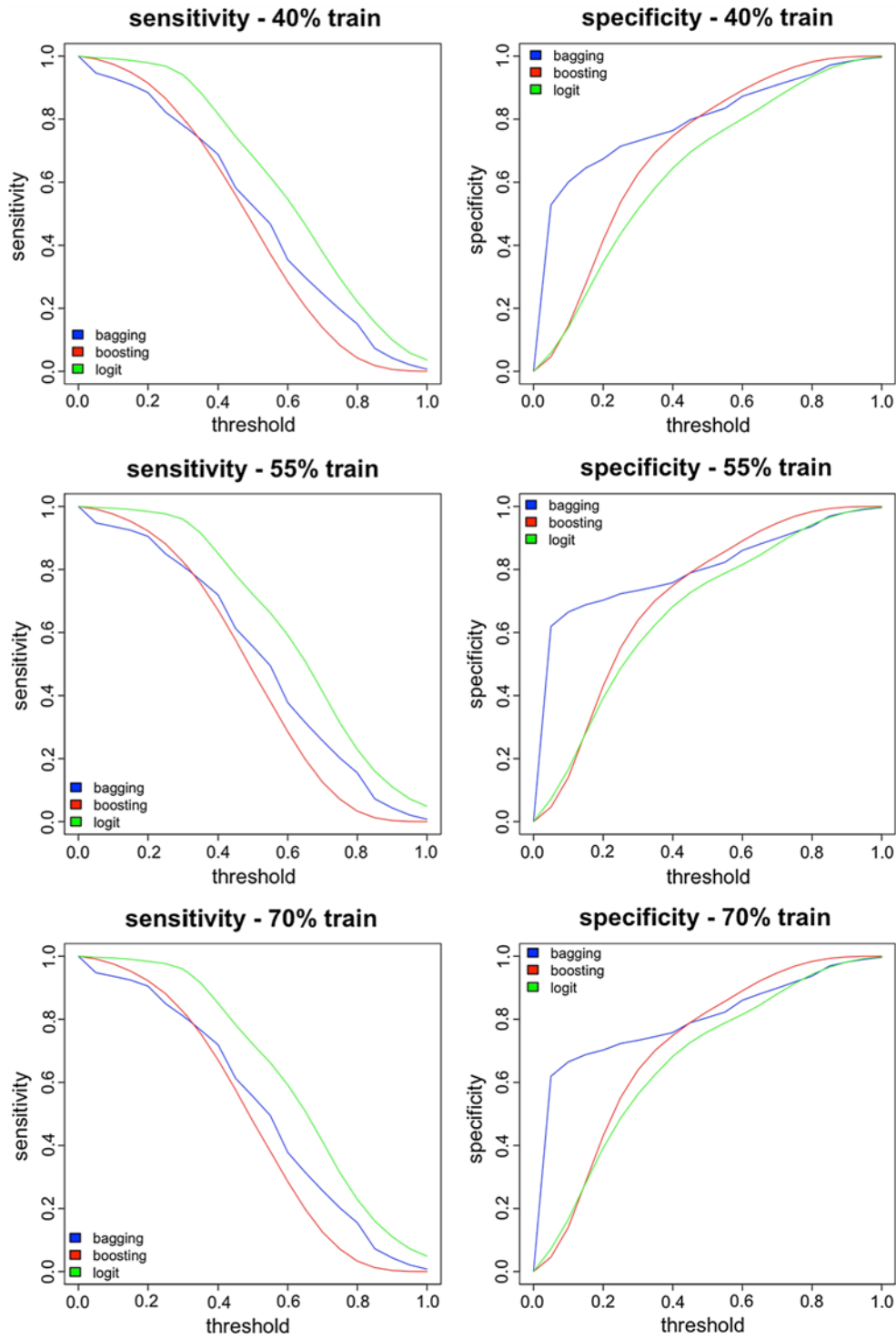


Figure 4. ROC Curves

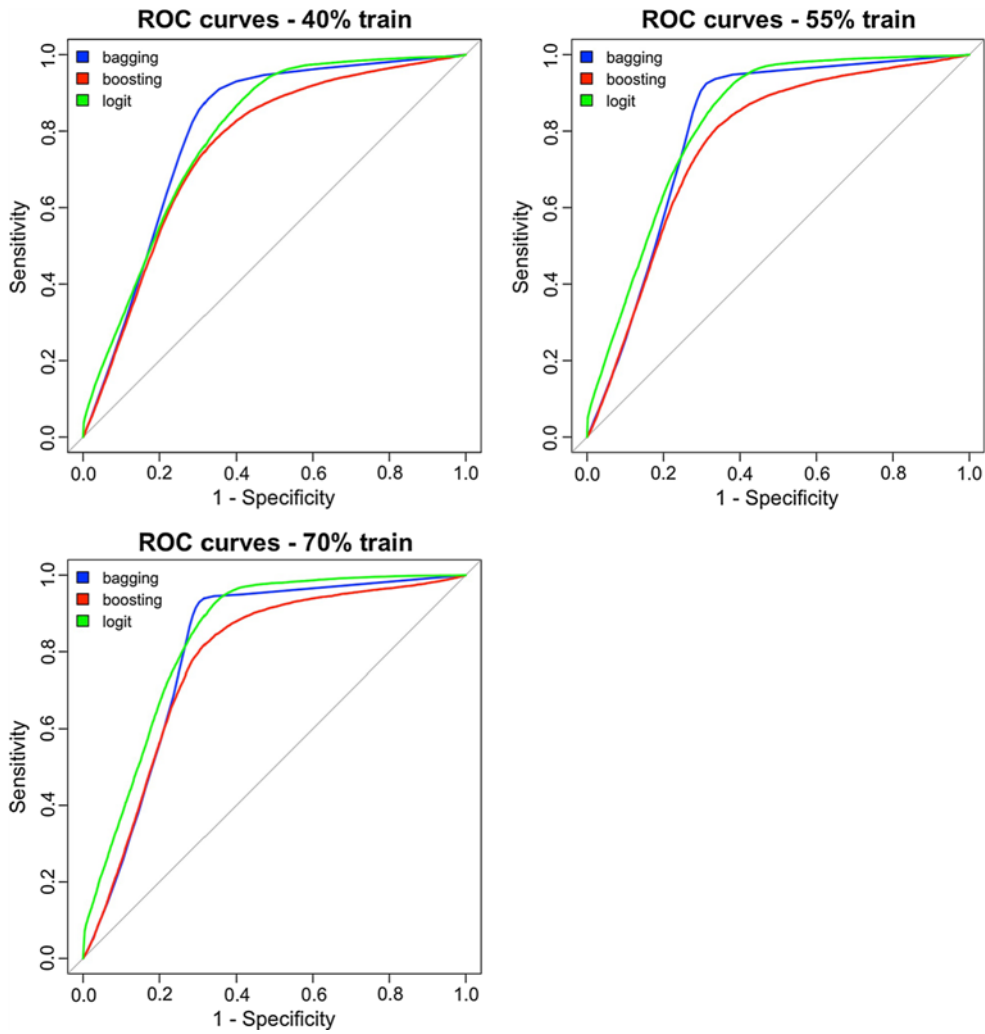


Table 2. Area under curve (ROC curves)

	training percentage		
	70	55	40
Bagging	0.805	0.807	0.800
Boosting	0.776	0.766	0.756
Logit	0.838	0.823	0.789

Results

As indicated in the methodology section, the Adabag R package was employed, which allowed the use of bagging and boosting to assemble the classification trees. In addition, logistic regression is used as baseline. In its application, different percentages were used to obtain the train and test samples (70%-30%; 55%-45% and 40%-60%). The purpose of this was to evaluate the performance of the different methods. It should be mentioned that

different thresholds were implemented for the classification; thus, threshold values were used that ranged from 0 to 1, with increments of 0.05. 1000 iterations were performed. In each of them, a random selection was made of which elements from the database would be in the training group and which would be in the test group. For each of these training and test groups, logistic regression, bagging and boosting were applied, obtaining the results presented below. With all of these results, the mean value and standard deviation obtained with the aforementioned 1000 iterations were calculated. The t value was also calculated to compare it with a two-tailed Student's t with 998 degrees of freedom.

Table 3. Logit coefficients

	logit - 40% train								
	Intercept	sector	endcp	arat	z	curat	lta	rdo	year
Coefficients	0.458	0.117	-0.038	0.040	-0.002	0.051	-0.049	0.002	0.541
SD coefficients	0.117	0.110	0.059	0.053	0.060	0.131	0.050	0.081	0.079
T	3.901	1.067	0.639	0.759	0.037	0.385	0.965	0.027	6.807
Significance	***	ns	ns	ns	ns	ns	ns	ns	***
Percentil interval 2.5%	0.221	-0.092	-0.155	-0.057	-0.125	-0.317	-0.140	-0.152	0.382
Percentil interval 95%	0.682	0.334	0.086	0.153	0.113	0.215	0.053	0.146	0.695
	logit - 55% train								
	Intercept	sector	endcp	arat	z	curat	lta	rdo	year
Coefficients	0.467	0.121	-0.039	0.035	-0.004	0.067	-0.051	-0.004	0.541
SD coefficients	0.082	0.081	0.043	0.035	0.044	0.072	0.035	0.056	0.057
T	5.725	1.493	0.908	1.005	0.082	0.934	1.448	0.071	9.532
Significance	***	ns	ns	ns	ns	ns	ns	ns	***
Percentil interval 2.5%	0.293	-0.040	-0.122	-0.032	-0.091	-0.126	-0.122	-0.114	0.437
Percentil interval 95%	0.631	0.273	0.050	0.104	0.085	0.178	0.024	0.106	0.664
	logit - 70% train								
	Intercept	sector	endcp	arat	z	curat	lta	rdo	year
Coefficients	0.464	0.121	-0.038	0.036	-0.006	0.072	-0.050	-0.004	0.545
SD coefficients	0.058	0.060	0.031	0.025	0.032	0.045	0.026	0.044	0.041
T	8.000	2.036	1.230	1.422	0.177	1.603	1.883	0.100	13.247
Significance	***	*	ns	ns	ns	ns	ns	ns	***
Percentil interval 2.5%	0.346	0.000	-0.098	-0.016	-0.075	-0.010	-0.104	-0.092	0.470
Percentil interval 95%	0.574	0.232	0.024	0.085	0.056	0.156	0.001	0.079	0.626
T-Bootstrap (based on t(998) two-tailed test); t(0.05;998)= 1.962; t(0.01;998)=2.581; t(0.001;998)=3.300; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ^{ns} Non-significant									

Bagging and Boosting are two widely-used methods (Alfaro et al., 2013) that produce a diverse set of classifiers through the manipulation of the training data with a learning algorithm (Dietterich, 2000). Bagging is a method to produce multiple versions of a predictor in order to obtain an aggregated predictor. These multiple versions are generated by making bootstrap replicates of the learning set (Chrzanowska et al., 2009). Thus, based on a training set with m cases, other sets are created (with replacement) (Dietterich, 2000). In addition, in boosting, the focus is on generating a series of classifiers. The training set for each member of the series is chosen depending on the performance of the previous classifier. Thus, the cases are extracted with replacement, with probability proportional to their weights (Dietterich, 2000).

Next, the results obtained from applying the methods described will be presented. The “rough data” produced by a classification system are counts of the correct and incorrect classifications of each class. This information is normally analyzed through a confusion matrix. A confusion matrix is a form of contingency table that shows the differences between the real and predicted classes for a set of labelled examples (Bradley, 1997).

With regard to the total error obtained, Fig. 1 and Table 1 show that the minimum error is always obtained using bagging, followed by the logistic regression and boosting. It should be pointed out that when using low thresholds, the bagging method provides better results. For values above this threshold, the three methods are equal, although logistic regression functions slightly better. This pattern is repeated for the three training levels analyzed, with the errors clearly being inferior when the training percentage is higher. However, the differences in error obtained are not very high.

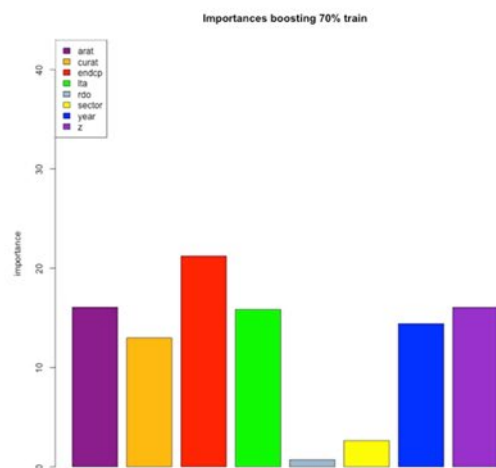
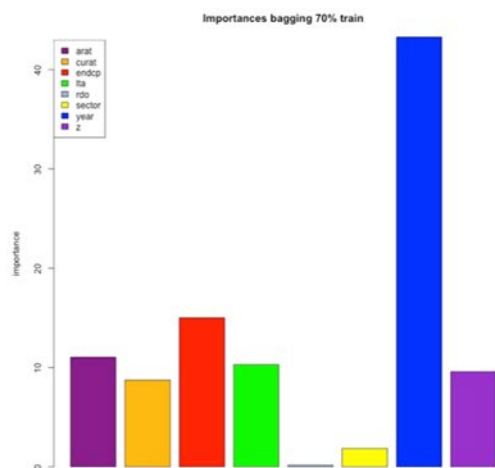
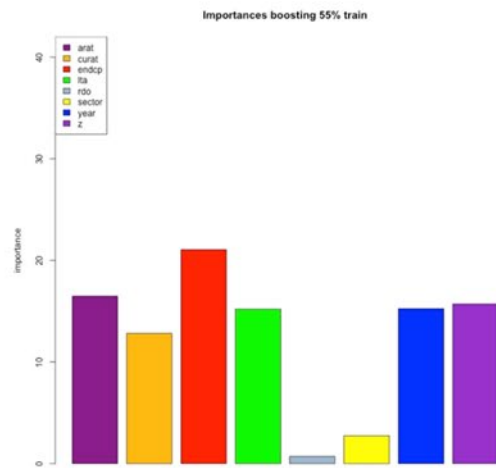
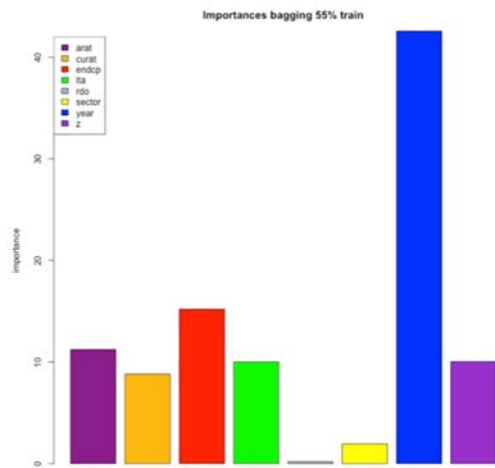
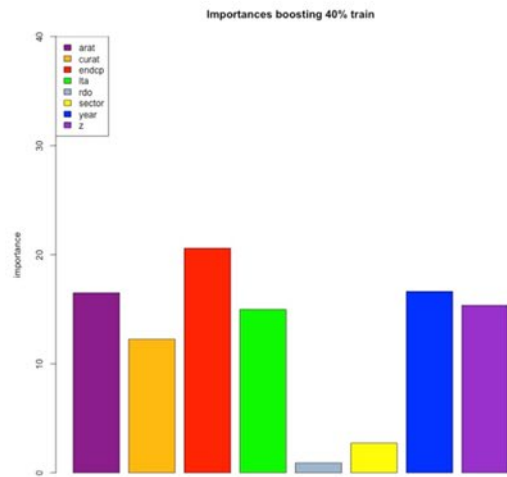
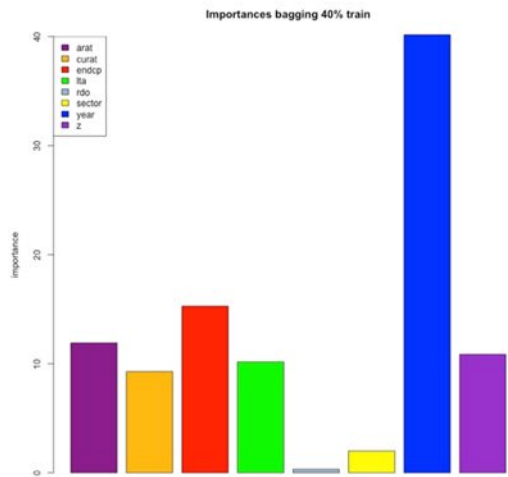
In addition, figure 2 shows that for the false positives, that is, the cases classified with problems in continuing management that in reality were not classified in this way by the auditors, both methods behave similarly, improving their performance as the threshold increases. However, bagging, at low threshold levels, has a considerably lower behavior, and logit is the model that presents the worst behavior. Regarding the false negatives, that is, those cases classified in the group with no ongoing management problems when they really have them, the logit model presents the best results. These results are repeated for all the training percentages employed. Moreover, an analysis is presented of sensitivity, “the proportion of true positives correctly identified by the test”, and specificity, “the proportion of true negatives correctly identified by the test” (Altman and Bland 1994:

1552) [Sensitivity = True positive/(True positive + False Negative); Specificity = True negative/(True negative + False Positive)]. For all the training percentages used, the logit model presents greater sensitivity, and bagging presents greater specificity, which means that these methods can be used in a complementary way to obtain better results (see Fig. 3).

In order to show the performance of both methods, next the ROC curves are presented for all the methods and with obtained with the aforementioned 1000 iterations were calculated. The t value was also calculated to compare it with a two-tailed Student's t test with 998 degrees of freedom.

Bagging and Boosting are two widely used methods (Alfaro et al. 2013) that produce a diverse set of classifiers through the manipulation of the training data with a learning algorithm (Dietterich 2000). Bagging is a method to produce multiple versions of a predictor in order to obtain an aggregated predictor. These multiple versions are generated by making bootstrap replicates of the learning set (Chrzanowska et al. 2009). Thus, based on a training set with m cases, other sets are created (with replacement) (Dietterich 2000). In addition, in boosting, the focus is on generating a series of classifiers. The training set for each member of the series is chosen, depending on the performance of the previous classifier. Thus, the cases are extracted with replacement, with a probability proportional to their weights (Dietterich 2000).

Figure 5. Importance of each of variables studied for the classification.



Next, the results obtained from applying the methods described will be presented. The “rough data” produced by a classification system are counts of the correct and incorrect classifications of each class. This information is normally analyzed through a confusion matrix. A confusion matrix is a form of contingency table that shows the differences

between the real and predicted classes for a set of labeled examples (Bradley 1997). With regard to the total error obtained, Fig. 1 and Table 1 show that the minimum error is always obtained using bagging, followed by the logistic regression and boosting. It should be pointed out that when using low thresholds, the bagging method provides better results. For values above this threshold, the three methods are equal, although logistic regression functions slightly better. This pattern is repeated for the three training levels analyzed, with the errors clearly being inferior when the training percentage is higher. However, the differences in error obtained are not very high. In addition, Fig. 2 shows that for the false positives, that is, cases classified as having problems in continuing management that in reality were not classified in this way by the auditors, both methods behave similarly, improving their performance as the threshold increases. However, bagging, at low threshold levels, has a considerably lower behavior, and logit is the model that presents the worst behavior. Regarding the false negatives, that is, those cases classified in the group with no ongoing management problems when they really have them, the logit model presents the best results. These results are repeated for all the training percentages employed. Moreover, an analysis is presented of sensitivity, “the proportion of true positives correctly identified by the test”, and specificity, “the proportion of true negatives correctly identified by the test” (Altman and Bland 1994: 1552) [Sensitivity = True positive/(True positive + False Negative); Specificity = True negative/(True negative + False Positive)]. For all the training percentages used, the logit model presents greater sensitivity, and bagging presents greater specificity, which means that these methods can be used in a complementary way to obtain better results (see Fig. 3). In order to show the performance of both methods, next the ROC curves are presented for all the methods and with the use of the different training percentages. These curves are a good way to visualize the performance of the classifiers (Bradley 1997). Thus, Fig. 4 shows that the bagging method performs better than boosting, and similar to logit. However, logit functions better than bagging when a high percentage of the sample is used to train, and worse when this percentage is low. Table 2 shows that the area under the curve when using a high percentage of training is greater for the logit model, with its value declining when this percentage is reduced. However, bagging’s performance does not decline when reducing the training set, as it remains stable in all the cases analyzed.

Tabla 4. Means of the importance, standard deviations, and Student-t for bagging and boosting

	Bagging - 40% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	11.913	9.290	15.282	10.178	0.318	1.990	40.158	10.871
SD Importances	6.196	5.452	7.235	5.857	0.705	2.351	11.488	5.715
T	1.923	1.704	2.112	1.738	0.451	0.846	3.496	1.902
Significance	ns	ns	*	ns	ns	ns	***	ns
	Boosting - 40% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	16.508	12.262	20.601	14.993	0.904	2.724	16.634	15.375
SD Importances	4.448	4.419	5.556	4.791	1.218	2.185	4.970	4.608
T	3.711	2.775	3.708	3.129	0.742	1.246	3.347	3.337
Significance	***	**	***	**	ns	ns	***	***
	Bagging - 55% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	11.232	8.818	15.203	10.001	0.197	1.947	42.561	10.042
SD Importances	4.701	4.482	5.582	4.344	0.386	1.884	7.924	4.044
T	2.389	1.968	2.724	2.302	0.509	1.033	5.371	2.483
Significance	*	*	**	*	ns	**	***	*
	Boosting 55% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	16.483	12.825	21.056	15.203	0.717	2.750	15.248	15.718
SD Importances	3.722	3.719	4.651	3.690	0.810	1.718	3.392	3.799
T	4.428	3.448	4.527	4.120	0.885	1.600	4.495	4.137
Significance	***	***	***	***	ns	ns	***	***
	Bagging - 70% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	11.043	8.732	15.020	10.293	0.175	1.850	43.299	9.588
SD Importances	3.511	3.363	4.242	3.315	0.290	1.407	5.236	3.000
T	3.145	2.596	3.541	3.105	0.603	1.315	8.270	3.196
Significance	**	**	**	**	ns	**	***	**
	Boosting - 70% train							
	arat	curat	endcp	lta	rdo	sector	year	z
Mean importances	16.080	13.002	21.234	15.851	0.714	2.637	14.422	16.060
SD Importances	2.927	3.093	3.633	3.042	0.671	1.320	2.360	3.151
T	5.494	4.204	5.845	5.210	1.064	1.998	6.111	5.096
Significance	***	***	***	***	ns	*	***	***
T-Bootstrap (based on t(998) two-tailed test); t(0.05;998)= 1.962; t(0.01;998)=2.581; t(0.001;998)=3.300; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ^{ns} Non-significant								

Next, we will try to demonstrate the relevance of the normative change in the content of the auditors' reports. First, the results obtained with the regression will be presented and then those obtained with the two tree assemblage methods.

Table 3 shows the regression coefficients obtained during the process. Following (Henseler et al. 2009), the use of bootstrapping (1000 subsamples) produces the t statistics and standard errors that make it possible to evaluate the statistical significance of the coefficients. Moreover, for each standardized regression coefficient, based on the

bootstrap technique, the nonparametric technique will be applied to generate confidence intervals of 95% using the percentile approach. In bootstrapping, subsamples are randomly drawn (with replacement) from the original set of data (Hair et al. 2014). Each subsample is used for training. In each subsample, we make sure that the proportion of each class is equal to that of the original sample. The importance is estimated with each subsample. With this technique, which does not make any assumptions about the distribution of the sample, the intention is to discover the significance of the coefficients. Thus, if the confidence interval for a certain coefficient does not include the value zero, it is necessary to reject the hypothesis that this coefficient could be zero. Furthermore, the t values obtained were compared to a Student-t distribution, in order to determine the statistical significance of each of the parameters. As can be observed, the year variable is significant with a significance level of 0.001; in addition, 0 is not included in its confidence interval. Thus, support was found for H1 of this study. Auditors are less likely to report going concern when this can cause serious problems for the company (modified report) than when this problem has less importance for it (highlighted paragraph). Moreover, for each of the 1000 logistic regressions carried out, the existence of multicollinearity between the independent variables was studied, and it was not found in any case. We also analyzed the significance of the year variable in each of the significance regressions, and it was always significant at the level of 0.001. Regarding the importance given by bagging and boosting to the variables used to classify the companies in the categories “modified opinion” and “non-modified opinion” (see Fig. 5), the bootstrapping technique (1000 subsamples) was used to generate the Student-t statistics and the standard errors. Thus, the statistical significance of the mean values for importance was obtained. Table 4 shows that, with the bagging method, for all the training levels used, the “year” variable was considered the most important, with a weight of more than 40%, which is more than twice the weight of the second variable. This table shows the value of t and its significance. The mean value of the importance of the “year” variable is significant at 0.001 for all the training percentages. In addition, when applying the boosting methodology, the position occupied by the “year” variable is between the second and the third, with scores around 15%. In all cases, the significance level is also 0.001. All of this shows the relevance of the “year” variable in the audit reports.

Conclusions

This study shows the relationship between the current regulatory framework and audit reports. The demonstration was carried out by analyzing companies that in the following years entered into bankruptcy, included in the same regulatory framework, which underwent a doctrinal change.

The main contribution of the present study lies in demonstrating that auditors, when there is a norm that produces a modified going concern opinion, are more hesitant to report this circumstance. All the companies studied ended up in bankruptcy proceedings, and their financial situations were delicate. However, the fact that there was a regulatory change made the auditors feel less reluctant to issue an ongoing concern report to the company.

This situation seems to indicate that auditors try not to worsen their client's situation even more by giving a qualified opinion that could accelerate their bankruptcy process. However, there is no doubt that this situation contradicts what a quality audit should be.

Furthermore, a contribution of the present study is the proposal of a methodology to objectively identify and evaluate the possible change in the auditor's behavior. The methodology is based on the use of assembled classification trees, specifically through bagging and boosting methods, in studies of this type. Moreover, a comparison of the results obtained with the two methods shows that the assembly with bagging yielded better results. As the baseline to evaluate these methods, logistic regression was used. The comparison shows that the results of bagging are quite similar to those obtained with logit, although the former has greater specificity and the latter has greater sensitivity. For this reason, these two methods could be used in a complementary way. Furthermore, the bagging results are more robust when the size of the training set is smaller.

Verifying what was found in previous literature (eg. Fargher & Jiang, 2008; Geiger et al., 2005; Gramling et al., 2011; Mo et al., 2015; Sercu et al., 2006; Xu et al., 2013), this study shows that users of accounting information must pay special attention to auditors' behavior when regulatory changes occur in the auditing field. Particularly, the organisms in charge of releasing auditing standards in Europe should establish greater controls or increase fines in order to avoid auditor discretion. In addition, with the proposed classifiers, it would be possible to establish, with a high level of accuracy, whether the auditors' opinion was coherent with the financial situation of any SME before the

regulatory change. Moreover, it can be applied to other regulatory changes that may occur in the future by simply re-training the classifiers. All of this, undoubtedly, can be of great interest to clients, creditors, financial entities, public administration, etc.

Regarding the study limitations, the main one has to do with the relatively small size of the sample. This size was conditioned by the number of SMEs that had entered into bankruptcy proceedings and had their complete information published in the SABI database.

Finally, regarding future lines of research, we think it would be interesting to find out whether the size of the auditors and their link to the company, etc., condition the way they react to a regulatory change. Moreover, different artificial intelligence tools should continue to be used in studies of this type. Furthermore, it would be useful to continue to examine the use of different tools based on artificial intelligence for the assessment of an auditor's behavior in the area of "economic opinions" or the detection of "dishonest" conduct.

Compliance with Ethical Standards

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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