

IDENTIFYING IMPRESSION MANAGEMENT STRATEGIES USING ARTIFICIAL INTELLIGENCE: A RESEARCH APPLIED TO THE BANKING SECTOR IN PORTUGAL

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Abstract: This paper aims to evaluate the eventual usage of impression management strategies by the Portuguese banking sector, particularly if the message tone used by the board is potentially influenced by macroeconomic, corporate governance and economic-financial factors. Data were obtained from the annual reports, complemented with additional financial information provided by the Portuguese Banking Association. The population consists of 58 messages from the management board obtained for 11 banks that operated in Portugal between 2009 and 2017. The information was collected using artificial intelligence tools. The findings are consistent with the identification of thematic manipulation strategies. The results confirm that the tone used by the Portuguese financial sector entities is in line with the macroeconomic evolution, as well as confirm that the corporate governance structure plays a big influence on the management discourse. In contrast, entities with a stronger level of corporate governance showed a less positive tone. Lastly, entities with higher liquidity and impaired assets tend to have a more positive tone. This study brings an innovative perspective regarding the methodology adopted, being pioneered in the application of technology under impression management studies in Portugal. Thus, future analyses may use these tools to mitigate errors and subjectivity.

Keywords: artificial intelligence; banking sector; impression management; letters to shareholders; thematic manipulation.

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Introduction

Recent years' financial disasters and scandals have increased the need for greater transparency in the information reported by entities to their different stakeholders (Seguí-Mas et al., 2018). Therefore, the analysis of the information disclosed by the entities is of great importance and is gaining more relevance (Salvioni and Bosetti, 2014). In line with technological evolution, the reporting of entities has also

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undergone several changes in recent decades, now covering a wide range of forms of disclosure that includes financial reporting, non-financial or sustainability reporting, and, more recently, the integrated report (IR) (Rodrigues et al., 2016).

The evolution of disclosures brings new challenges to the structure and content of the information presented. Thus, the standardization of the accounting report presents a set of concerns that goes beyond financial reporting, namely sustainability reporting, management commentary, and other subjects that do not integrate the designated complete set of financial statements (FS). The management comments are an example of additional information published by the entities in their annual reports. For that purpose, the International Accounting Standards Board (IASB) issued the Practice Statement (PS) 1: Management Commentary, which aims to support management in the presentation of useful comments related to the entity's financial information. Notwithstanding the numerous indications presented by the IASB, the entities are equipped with a series of strategies to convey a message that differs from reality. However, it is important to refer that investors increase their capability to carry out a careful analysis of the disclosed information, either due to the increase in available information (for example, entities' data publicly shared on the internet) or the emergence of new technologies that allow a quick and consistent analysis of the financial and non-financial information disclosed (Silva & Alves, 2001).

In this context, the analysis of the strategies used by the management to manipulate users' perceptions emerged as a relevant matter. These strategies are recognized in the literature as impression management (IM). IM strategies are defined as a behaviour assumed by the management to strategically select, make available and present information to distort readers' perceptions of the entity's reality and influence their perception of the performance and future perspectives (Godfrey et al., 2003). Furthermore, IM strategies can take on several characteristics, such as manipulating the readability of the disclosures, deliberately changing the graphics of the financial performance, manipulating the tone of speech, and attributing positive results to own actions and negative results to third-party actions, among others.

This paper aims to research how the Portuguese banking sector entities use thematic manipulation as an IM strategy in the management commentary. For this purpose, the shareholders' letters published by these entities will be analysed using artificial intelligence tools, namely text mining and sentiment analysis.

The relevance of this research is justified by the financial scandals that recently occurred in the Portuguese banking sector. In this context, analysing any IM strategies considered by the management and identifying existing communication patterns can have significant importance for stakeholders. More specifically, this paper aims to analyse whether the tone used in the shareholders' letters is potentially influenced by the entities' macroeconomic, corporate governance (CG), and economic-financial factors. This paper also proposes the use of other explanatory factors that, as far as the present research has gone, no other empirical paper has used in this field of impression management, namely, the macroeconomic factors and the

impaired assets. This letter is an important measure considering its relevance for the entities in the banking sector. Therefore, considering the above-referred aspects, this study is a potential contributor to scientific research in this area.

The dependent variable (the tone used in the shareholders' letters) was determined by using several data analytics software, namely "R" and Alteryx, as detailed in the section "hypotheses and methodology". The methodology used is innovative in studies of this nature, as no other known Portuguese study has explored artificial intelligence tools to obtain the proposed dependent variable. Thus, relevant contributions for future investigations are identified as using such tools enhances the reduction of errors and subjectivity inherent in the analysis.

This paper is divided into five chapters in addition to this introduction. The next chapter is dedicated to the literature review related to the subject of this research. The third chapter focus on the hypotheses development and the methodology description. Following, the results obtained, based on the proposed methodology, are presented and discussed in the fourth and fifth chapters, respectively. Finally, the sixth chapter summarizes the conclusions obtained and presents the limitations and suggestions for future investigations related to the topic.

Literature Review

In the context of accounting reporting, IM strategies are defined as a behaviour assumed by the management to strategically select, make available and present information to distort readers' perceptions of the entity's reality and influence their perception of the performance and future perspectives (Godfrey et al., 2003). In addition to manipulating the information disclosed, IM strategies can also be presented as the obfuscation of relevant information (Curtis, 2004; Leung et al., 2015). Leung et al. (2015) argue that disclosures made in discretionary narratives and shareholders' letters are an important regulatory and CG issue, as the management can provide more detailed information on performance and prospects. Although shareholders' letters can reduce the information gap between executive board members and stakeholders, the disclosures made in the letters are at the management's discretion and, therefore, subject to interventions. As such, any influence on this content can create a more positive or negative perception of how the entities are being managed.

One of the economic theories related to IM strategies is the agency theory (Osma and Guillamón-Saorín, 2011; Pinheiro, 2014), which, in its classic version (Fama and Jensen, 1983), models the relationships between the different shareholders of an entity, which are full of conflicts of interest (Du Toit and Esterhuyse, 2021). In this sense, Osma and Guillamón-Saorín (2011) argue that it is expected that the management will base its decisions on the interests of shareholders. However, the management can make decisions to maximize its benefits since they have a set of information about the entity's actual performance. Asymmetry between available and disclosed information can result in serious moral problems on the management side (Abed et al., 2022).

IM strategies aim to present a “selfish” view of the entity as well as of its performance (Pardo and Giner, 2022). The identification of IM strategies is especially difficult in the business context as the management actions cannot be directly observed (Osma and Guillamón-Saorín, 2011). Consequently, financial statement users must carry out their due diligence regarding the performance of the entity's management based on the reports that are prepared by the management itself (Lambert and Richard, 2001).

Research on IM strategies indicates that management may be incentivised to distort stakeholders' perceptions, manipulating the financial statements or other communications made, directly or indirectly, improving the performance perception and minimizing the repercussion of negative news (Cooper and Slack, 2015; Moreno et al., 2019). Management generally perceives that if the facts are fully disclosed, the stakeholder impressions may be less favourable (Leung et al., 2015).

According to Merkl-Davies and Brennan (2007), the reasons behind the usage of IM strategies from the financial and non-financial information preparer perspective can be classified into two categories: concealment and attribution.

The concealment strategy incorporates two techniques: obscuring or bad news and emphasizing good news.

Regarding the first technique (bad news), two strategies are used and, in both cases, through verbal manipulation in the way that information is presented, namely the syntactic manipulation strategies of readability (that is, making the text more difficult to read) and rhetorical manipulation (that is, the use of persuasive language). Syntactic manipulation in narratives presumes that the management deliberately uses a more difficult-to-read language to hide negative performance. The rhetorical manipulation strategy also follows the concealment hypothesis indicating that management makes strategic linguistic choices to persuade or impress readers and conceal negative performance.

In the second case (good news), four strategies are used, with verbal and/or numerical manipulation in the way that the information is presented and/or disseminated, namely:

- i. Thematic manipulation, which emphasizes positive words or financial performance, is a verbal manipulation of the disclosed information. Thus, it analyses the positive and negative expressions used in the writing process
- ii. Visual and structural manipulation emphasizes the visual aspect and the strategic ordering of verbal or numerical information. This strategy can be used to emphasize information through, for example, the use of colours, repetitions, and reinforcements (Leung et al., 2015).
- iii. Performance comparisons involve choosing benchmarks that portray the current financial performance as best as possible. Leung et al. (2015) state that this strategy highlights moments of positive performance.
- iv. Choice of numbers with a positive and relevant impact on the profits obtained by the entity to portray a more favourable financial performance. Allen et al. (2007) understand that the choice of specific results, namely

results associated with earnings, is also an IM strategy, with a strategic presentation being made in the press releases and narratives disclosed, thus making investors' judgments less refined.

Lastly, the attribution strategy acknowledges certain results to different factors through verbal manipulation. It is a "selfish" strategy because positive organizational results are attributed to internal factors, while negative results are attributed to external circumstances (Aerts, 2005).

Studies focusing on thematic manipulation, which is in the scope of this research, assume that the management seeks to hide bad news, either through non-disclosure or through less emphatic disclosure, compared to positive news (Merkl-Davies and Brennan, 2007).

According to Pinheiro (2014), thematic manipulation is based on the principle of Pollyanna. The phenomenon assumes that positive and affirmative words are used more frequently than negative ones in the shareholders' letters, regardless of the entity's financial position (Geppert and Lawrence, 2008).

Empirical studies carried out on this subject indicate that directors seek to present themselves in the best possible way, both their attributes and the performance of the entity under their command and strategic supervision. This presentation is manifested by the prevalence of more positive words and subjects rather than negative ones (Merkl-Davies and Brennan, 2007).

As studied by Smith and Taffler (2000), the two generic approaches to thematic analysis are (i) objective and guided analysis, which involves counting the occurrence of words or concrete references, and (ii) more subjective meaning-oriented analysis, focusing on the analysis of the issues underlying the texts under investigation.

Weber (1990) argues that the word frequency analysis is more reliable than the thematic analysis due to the subjectivity of the latter. However, some authors support thematic analysis as a content study tool when it requires a user's judgment to determine the hidden messages transmitted (Smith and Taffler, 2000).

Thematic manipulation has been analysed in empirical studies in several countries, including Portugal. Table 1 summarizes some of the studies identified on the subject, including the country and type of analysis, the sample, the explanatory factors, as well as the source of the narratives under assessment.

One of the main aspects analysed in empirical studies is related to the approach of keywords and positive/negative emotions in the narratives (Abrahamson and Park, 1994; Abrahamson and Ami, 1996; Smith and Taffler, 2000; Clatworthy and Jones, 2003; Davis et al., 2006; Pinheiro, 2014; Oliveira and Borges, 2016). The second line of investigation, associated with thematic manipulation, focuses on the phrasal analysis of messages, which includes the structure's analysis regarding complexity, numerical intensity, dimension and others (Rutherford, 2005; Henry, 2006; Oliveira and Borges, 2016).

Regarding the studies carried out in Portugal, Pinheiro (2014) concluded that Portuguese financial entities do not significantly adopt IM strategies to disguise

reality, identifying that performance levels do not affect the adoption of IM strategies. However, it was found that there are exceptions in some specific years under the analyses. The variables “references to third parties” and “words with negative emotion” significantly impacted the period from 2006 to 2012. The author argues that this event may be related to the financial crisis experienced in this period. Additionally, it states that there are significant differences in adopting IM strategies in entities with negative and positive performance. Still, these are rare, having identified only two variables that showed significant differences in three different years: number of words and words with positive emotions. Thus, Pinheiro (2014) suggests the unconscious use of IM strategies to favor the company's image and not the stakeholders' perceptions of organizational performance.

In line with Pinheiro (2014), Oliveira and Borges (2016) also concluded that Portuguese non-financial entities do not adopt IM strategies to present a disguised image, having verified that the performance does not influence the adoption of IM strategies.

Finally, using the content analysis of shareholders' letters of 27 financial institutions from 2006 to 2012, Oliveira et al. (2019) added that, even during the financial crisis, most Portuguese financial entities did not tend to adopt IM strategies. However, the authors identified some evidence of the adoption of IM strategies during this period.

Table 1. Thematic manipulation research

Author	Country	Object	Sample	Explanatory factors	Source	
Abrahamson and Park (1994)	USA	Positive and negative keywords	1,118	Profitability and CG variables	Shareholders letters	
Smith and Taffler (2000)	UK		66	Firm failure		
Clatworthy and Jones (2003)	UK		100	Profitability		
Pinheiro (2014)	Portugal	Words with positive/negative emoticons	128	Profitability and size		
Oliveira and Borges (2016)	Portugal	Positive/negative words	45	Profitability, size, debt, listed versus non-listed companies, customers'/suppliers' proximity		
Rutherford (2005)	UK	Frequency of 90 keywords	44	Profitability		Accounting and financial narrative
Abrahamson and Ami (1996)	USA	Positive and negative keywords	1,355	Profitability, size, return on capital		Press releases
Davis, Piger and Sedor (2006)	USA	Optimism/pessimism	23,622	Profitability, size, sector, period		

Henry (2006a)	USA	Tone (positive/negative); size of press-release; complexity; numerical intensity	1,366	Return on capital
Henry (2006b)	USA	Keywords; the size of press releases; complexity; numerical intensity; tone	441	Market reaction

Despite the relevant evidence found in those studies, the analysis performed for the present study can be seen as one of the most innovative in the subject as the dependent variable (the tone of the message in the shareholders' letters) was identified using several innovative tools.

Research Hypotheses and Methodology

This research aims to analyse the factors that potentially influence the message tone used in the shareholders' letters published by banks in Portugal. The information was gathered from their annual reports.

The sample was established from a total of 27 banks and credit institutions that operated in Portugal between 2009 and 2017. However, in the final sample count with 11 entities, it was necessary to exclude several entities due to the following reasons: entities that did not present shareholders' letters; entities that were part of a group of companies that consolidated into a single entity (in such cases, it was considered only the data of the dominant entity); or the annual report did not meet the necessary conditions for the application of the methodology, as they did not allow the dependent variable of the study to be obtained.

After defining the sample for the study, 58 messages to shareholders were analysed through a computerized textual analysis, thus comprising 69.362 words totalling 2.116 sentences.

Initially, the "R" software was used as a data mining tool. Later, the shareholders' letters were converted into a single text string, separated into several sentences (it was considered that a sentence starts with a capital letter and ends with a period).

After the phrases preparation necessary for the analysis, the software that would serve as the engine for identifying the tone used in the messages was identified. Alteryx was the software chosen to act as an interface for the data processing tools. The Alteryx software is commonly used for data analytics and is designed to simplify advanced data science and analytics analysis. Alteryx's intervention calculated a score associated with each phrase containing the shareholders' letters. The scoring represents the phrasal classification determined through an Application Programming Interface (API) from Microsoft, which used Alteryx to activate the

machine learning software over the database with non-financial information. Microsoft's API contains a sentiment analysis functionality that evaluates the phrases and returns sentiment scores and labels for each sentence.

After activating the API through Alteryx, the artificial intelligence system returns a sentiment label (such as “negative” and “positive”) and sentence confidence level (scoring), which range from “0” to “1” (with “0” being the most negative score for a sentence and “1” being the most positive). The final scoring computed as a dependent variable results from the quotient between the sum of the scorings obtained through the API and the total number of sentences analysed for each entity. Thus, and despite the different approach observed in most studies on this subject, the definition of the final value attributed to the message tone (scoring) eventually followed a similar approach (Arslan-Ayaydin et al., 2016; Davis et al., 2015; Davis and Tama-Sweet, 2012; Feldman et al., 2010; Loughran and McDonald, 2011; Yekini et al., 2016 and Bassyouny et al., 2020).

Bearing the previous objectives defined for this research, eleven hypotheses were created. Table 2 summarises the proposed hypotheses, the independent variables considered and the research used as a reference.

Table 2. Hypotheses and independent variables

Explanatory factors	Hypotheses (H)	Independent variables (proxies)	Research used as reference
Macroeconomic evolution	H1 The tone of the shareholders' letters published by the banking entities is directly influenced by the evolution observed in the national macroeconomic environment.	CGDP = Change in gross domestic product [year (n) – year (n-1)]	DiMaggio and Powell, 1991); (Patelli and Pedrin, 2014)
Board structure (CG)	H2.1 The tone of the shareholders' letters published by the banking entities is inversely influenced by the presence of non-executive directors in the management body.	CG1 = Share of non-executive directors	(Duellman and Ahmed, 2013); (Hermalin and Weisbach, 2003); (Iatridis (2016); (Xie <i>et al.</i> , 2003);
Control (CG)	H2.2 The tone of the shareholders' letters published by the banking entities is inversely influenced by the percentage of ownership held by the controller.	CG2 = Higher percentage held by the owner	(Abrahamson and Park, 1994); (Brown <i>et al.</i> , 2006); (Iatridis, 2016); (Webb <i>et al.</i> , 2003)
Remuneration policy (CG)	H2.3 The tone of the shareholders' letters published by the banking entities is directly influenced by the remuneration policy based on the entity's performance.	CG3 = If there is a performance-based pay (dummy variable)	(Hooghiemstra <i>et al.</i> , 2017); (Rodrigues, 2014)

Explanatory factors	Hypotheses (H)	Independent variables (proxies)	Research used as reference
Size	H3.1 The tone of the shareholders' letters published by the banking entities is inversely influenced by the entity's size.	IRS = Interest and rendering of services	(Abrahamson and Ami, 1996); (Davis <i>et al.</i> , 2006); (Francis, 2001); (Oliveira and Borges, 2016); (Pinheiro, 2014)
Liquidity	H3.2 The tone of the shareholders' letters published by the banking entities is directly influenced by the entity's liquidity.	LA = Loans-to-assets	(Ball e Shivakumar, 2005); (Cano-Rodriguez, 2010); (Iatridis, 2016); (Kumbirai and Webb, 2010); (Samad, 2004);
Impairment level	H3.3 The tone of the shareholders' letters published by the banking entities is directly influenced by the entity's level of impaired assets.	WITCG = Weight of impairment in total credits granted	(Achou and Tegnuh, 2008); (Abata, 2014); (Ahamed, 2017); (Alhassan, 2015); (Casu <i>et al.</i> , 2006);
Indebtedness	H3.4 The tone of the shareholders' letters published by the banking entities is directly influenced by the entity's indebtedness.	DA = Debt-to-assets	(Bassyouny <i>et al.</i> , 2020); (Yekini <i>et al.</i> , 2016)
Profitability	H3.5 The tone of the shareholders' letters published by the banking entities is inversely influenced by the entity's profitability.	ROA = Return on assets	(Aerts, 2005); (Boudt and Thewissen, 2019); (Clatworthy and Jones, 2003); (Merkl-Davies <i>et al.</i> , 2011); (Powell, 1996); (Yan <i>et al.</i> , 2019)
Performance growth	H3.6 The tone of the shareholders' letters published by the banking entities is inversely influenced by the observed growth in the entity's profitability.	CROA = Change in return on assets [year (n) – year (n-1)]	
Activity growth	H3.7 The tone of the shareholders' letters published by the banking entities is inversely influenced by the observed growth in the entity's activity.	CIRS = Interest and rendering of services growth [year (n) - year (n-1)]	

Research Results

This research uses the message tone as a dependent variable, which was calculated through the scoring variable based on the analysis of 69.362 words in 2.116 sentences from 58 shareholders' letters.

Table 3 presents the descriptive statistics, defined by the mean, median, standard deviation, minimum and maximum values for the dependent and independent variables.

Table 3. Descriptive statistics for the variables proposed

Variable	Average	Mean	Minimum	Maximum	Standard error
Scoring	0.626	0.612	0.400	0.902	0.107
CGDP	0.004	0.013	-0.041	0.035	0.024
CG1	0.540	1.000	-0.042	1.000	0.497
CG2	0.670	1.000	0.100	1.000	0.377
CG3	0.328	0.000	0.000	1.000	0.473
IRS (x10 ⁶ euros)	1.853	1.195	0.006	5.368	1.539
LA	0.622	0.659	0.120	0.880	0.171
WITCG	0.062	0.052	0.000	0.240	0.049
DA	0.919	0.925	0.771	0.981	0.038
ROA	0.000	0.003	-0.042	0.049	0.013
CROA	-0.001	0.000	-0.044	0.031	0.011
CIRS	-0.088	-0.107	-0.510	0.692	0.198

The data show that the average message tone used by entities in the Portuguese banking sector was set at 0.63, which means that the average tone tends to be positive. The most negative (positive) tone scored 0.4 (0.9). It can also be seen that the Portuguese banking sector has, globally speaking, reduced profitability, a significant level of heterogeneity regarding the size criteria, and low levels of profitability. Notwithstanding, a significant level of heterogeneity can also be seen based on the different financial variables considered, such as size, profitability, liquidity, and indebtedness.

Table 4 presents the correlation between the dependent and independent variables proposed.

Table 4. Correlation table

	CGDP	CG1	CG2	CG3	IRS	LA	WITCG	DA	ROA	CROA	CIRS
Scoring	.48**	-.81**	.44**	-.26*	-0.10	0.24	.40**	0.06	-.27*	0.18	0.03
CGDP	1	-.31*	.27*	-0.17	-.53**	-.27*	.32*	-.35**	-0.01	0.12	0.02
CG1		1	-.44**	0.13	0.11	-.29*	-0.23	-0.08	0.19	-0.14	0.10
CG2			1	-.31*	-.28*	0.09	.37**	0.11	-0.17	0.13	-0.02
CG3				1	0.08	0.19	-.35**	0.21	.30*	0.04	-0.10
IRS					1	.43**	-0.25	.47**	-0.11	0.00	0.09
LA						1	-0.24	.39**	-0.16	0.17	0.12
WITCG							1	-0.01	-.49**	0.17	-0.01
DA								1	-.30*	0.17	0.11

ROA	1	.27*	0.00
CROA		1	0.11
CIRS			1

* Significant at a 5% level; ** Significant at a 1% level

As regards the dependent variable (scoring), the most significant level of correlation is found for the variable board structure (CG1). Nevertheless, all variables of corporate governance seem to be statistically significant at a 5% level, as well as the macroeconomic evolution (CGDP), the impairment levels (WITCG), and profitability (ROA). The correlation analysis amongst the independent variables can be useful for identifying collinearity issues. As for the assumptions of the models, the results of the correlation carried out for the independent variables presented coefficients that assumed values below ± 0.5 , indicating a weak or moderate correlation. As such, no significant collinearity problems were found.

The regression model results are based on the application of the enter method, which includes the multicollinearity diagnosis through the Variance Inflation Factor (VIF), which identified all figures below the threshold considered critical for this effect (VIF greater than 10).

According to the results presented in Table 5, the analysis of variance (ANOVA) is statistically significant and, as such, has explanatory power.

Additionally, it is verified through the adjusted R^2 (adjusted coefficient of determination) that the independent variables used in the model can explain the message tone (dependent variable) in approximately 73.4%. This result is even higher than the findings from other studies mentioned above, where the adjusted R^2 varies between 42.2% in Iatridis (2016) and 64.6% in Cano-Rodriguez (2010).

Table 5. Summary Statistics of Regression Analysis

Summary					
Variables	R	R-squared	Adjusted R-squared	Standard error	Durbin-Watson
All independent variables	0.886	0.786	0.734	0.055	2.511
Anova					
Description	Sum of squares	FS	Mean square	Z	Sig.
Regression	0.509	11	0.046	15.328	<.001
Residual	0.139	46	0.003		
Total	0.647	57			

As regards the results obtained, shown in Table 6, significant statistical associations were identified between the tone of the message (scoring) and five independent variables, considering cases in which the significance level is below the threshold of 10% (two cases were identified at this level).

Table 6. Results of regression analysis

Variables	Coefficients						Collinearity Statistics	
	Non-standardized coefficients		Standardized coefficients	T	Sig.			
	B	Error	Beta			Tolerance	VIF	
CGDP	1.337	0.396	0.301	3.374	0.002	0.587	1.703	
CG1	-0.130	0.020	-0.607	-6.644	0.000	0.557	1.794	
CG2	0.006	0.025	0.020	0.222	0.825	0.588	1.700	
CG3	-0.017	0.019	-0.075	-0.908	0.369	0.682	1.465	
IRS	0.011	0.006	0.154	1.657	0.104	0.540	1.853	
LA	0.153	0.090	0.245	1.695	0.097	0.223	4.492	
WITCG	0.581	0.280	0.265	2.079	0.043	0.286	3.492	
DA	-0.317	0.389	-0.113	-0.815	0.419	0.241	4.146	
ROA	0.483	0.992	0.060	0.487	0.629	0.312	3.209	
CROA	-0.251	0.871	-0.026	-0.288	0.774	0.560	1.785	
CIRS	0.029	0.038	0.054	0.749	0.458	0.913	1.095	
(Constant)	0.835	0.309		2.705	0.010			

Firstly, there are positive associations between the scoring and the independent variables CGDP (H1), IRS (H3.1), LA (H3.2), and WITCG (H3.3), representative of macroeconomic factors (CGDP (H1)) and economic and financial factors, more specifically size (IRS (H3.1)), liquidity (LA (H3.2)) and impairment level (WITCG (H3.3)). The significance level for size and liquidity is about 10%, which means that the analysis based on this finding must be more cautious. This is particularly relevant concerning the size variable, as the lowest coefficient in absolute value was identified (close to zero). On the other hand, the highest values for the coefficients can be found, respectively, for the variables CGDP (H1), WITCG (H3.3) and LA (H3.2), stressing that the macroeconomic factors, the impairment levels, and liquidity can be seen as the most relevant findings as regard to the positive association found.

Secondly, it appears that the tone is negatively associated with the CG variable, which represents the number of non-executive directors (CG1, associated with H2.1), although with the second lowest coefficient in absolute value identified.

Discussion

The results of this paper confirmed the hypotheses associated with the macroeconomic factors, indicating that the tone used in the shareholders' letters published by the banking sector entities in Portugal had a possible explanation for the evolution of GDP. Although the literature on the subject is still limited in this regard, the suggestions made by Patelli and Pedrin (2014) are a worthy mention, as

well as the evidence already obtained in Portugal on the subject, namely the studies by Pinheiro (2014), Oliveira and Borges (2016) and Oliveira et al. (2019).

The second conclusion drawn points out the existence of a negative relationship between the tone and the number of non-executive directors on the entities' board of directors, a variable associated with the CG. One of the explanations associated with this result is presented by Duellman and Ahmed (2013), which is later confirmed by Iatridis (2016). The authors reinforce the idea that the presence of non-executive directors on the board of directors enhances the protection of the shareholders' interests and increases the existing control over the management's actions. Therefore, due to the increasing level of the entities' control through governance, the use of IM strategies is reduced.

The third conclusion is that a more positive tone is associated with higher liquidity and impairment levels. These results are aligned with the conclusions obtained by LaFond and Watts (2008), Cano-Rodriguez (2010), and Iatridis (2016), who claim that entities with low liquidity or highly leveraged tend to make less positive disclosures since they are controlled by the structure of creditors associated with the funding of the entities. Another argument used by the authors points to the fact that the low level of liquidity implies using a less positive discourse to convey the entities' future financial potential.

As for the impairment levels, measured by the weight of impairment losses in total credits granted, it is worthwhile to mention that this variable was considered by authors such as Alhassan (2015) and Ahamed (2017) while assessing the financial sustainability of the banking sector but relatively neglected by the literature on impression management. Therefore, this research also contributes to the literature on this topic by highlighting the importance of considering the industry under analysis. Then, one of the potential explanations for the results obtained (a positive association with scoring) is that banks with lower quality assets, measured by the higher level of the weight of impairment losses in total credits granted, present a more positive discourse to dissipate attention on such assets.

In a nutshell, a possible justification for the results obtained is found in Aerts (2005). According to the author, one of the consequences for the entity that presents negative indicators is the emergence of conflicts of interest between the management and its shareholders. In such cases, management may be motivated to manipulate shareholders' perceptions and decisions regarding financial performance. These findings are consistent with the research by Clatworthy and Jones (2003), who identified evidence of a stronger Pollyanna effect in companies with low financial performance.

Conclusion

The findings in this paper are consistent with the identification of thematic manipulation strategies. The results confirm that the tone used by the Portuguese financial sector entities is in line with the macroeconomic evolution, as well as confirm that the corporate governance structure plays a big influence on the

management discourse, whereas entities with a stronger level of corporate governance showed a less positive tone. In contrast, entities with higher levels of liquidity and impaired assets tend to have a more positive tone.

Several IM strategies can be used by entities to present a different perspective of their figures and their past, present and future (planned) actions. These possible misrepresentations of reality can change the decision-making by users based on the analysis of the risks and opportunities that can be read through this information. Literature has found that those strategies are often used, deliberately or unintentionally, within the different methods that entities can use to communicate with their users.

Depending on the stakeholders' perspective that uses this information, these data may have different purposes. Therefore, in addition to users, identifying and properly knowing IM strategies used by entities may also be relevant to different entities, such as regulators, financial and non-financial standards-setting bodies and auditors.

Despite the different IM strategies and subjects that literature has been covering since the seminal research from the last quarter of the 20th century, this theme remains relevant as long as it can be assessed and adapted from the perspective of trending topics in accounting.

Therefore, the emergence of non-financial reporting, social media, new technologies and information management systems as research sources and tools to assess IM strategies may be mentioned as examples of new future avenues on this subject, as the most recent research provides evidence. As proposed in this paper, big data, artificial intelligence, and machine learning can be mentioned as sources and tools that represent new avenues for future research in this context.

As no other known national studies have followed a similar methodology to obtain the dependent variable proposed, it is possible to indicate this characteristic is the main contribution of this investigation. On the other hand, regarding the explanatory factors analysed, it was observed that the macroeconomic factor was not considered in studies on the subject. As such, this element also deserves to be highlighted as another potential contribution to scientific research in this area.

A limitation identified in the study is related to the limited disclosure of FS of entities in Portugal, especially unlisted ones. More specifically, the release of financial data was limited to a period that did not allow for the consideration of a broader historical series. Additionally, in the specific context of handling messages, it was identified that some entities do not publicly disclose this component of the report or, sometimes, include it in protected documents or in image format, which does not allow for automatic processing or efficient use of non-financial data.

As suggestions for future investigations, the use of the same methodology and dependent variable applied to the Portuguese non-financial sector is recommended. A parallel study will allow identifying the main differences between sectors and strategies used. Extended analysis may also be carried out on other IM strategies, in addition to those identified in this research, as well as reproducing this analysis

proposal to other countries, namely the financial sector of the European Union, or even inclusion in the same study financial and non-financial entities.

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IDENTYFIKACJA STRATEGII ZARZĄDZANIA WRAŻENIEM Z WYKORZYSTANIEM SZTUCZNEJ INTELIGENCJI: BADANIA PRZEPROWADZONE W SEKTORZE BANKOWYM PORTUGALII

Streszczenie: Niniejszy artykuł ma na celu ocenę ewentualnego wykorzystania strategii zarządzania wrażeniem w portugalskim sektorze bankowym, szczególnie w przypadkach gdy komunikaty przekazywane przez zarząd są potencjalnie uzależnione od czynników: makroekonomicznych, nadzoru korporacyjnego czy ekonomiczno-finansowych. Dane uzyskano z raportów rocznych, uzupełnionych dodatkowymi informacjami finansowymi dostarczonymi przez Portugalskie Stowarzyszenie Banków. Próba badawcza składa się z 58 zestawień zawierających informacje dotyczące badanej kwestii dostarczonych przez zarządy 11 banków, które działały w Portugalii w latach 2009-2017. Informacje zostały zebrane za pomocą narzędzi sztucznej inteligencji. Wyniki potwierdzają zidentyfikowane branżowe strategie manipulacji. Przekaz stosowany przez portugalskie podmioty sektora finansowego jest zgodny z ewolucją makroekonomiczną, dodatkowo potwierdza, że struktura nadzoru korporacyjnego ma duży wpływ na dyskurs zarządczy. Podmioty o silniejszym poziomie

nadzoru korporacyjnego wykazywały mniej pozytywny ton przekazywanych informacji. Natomiast, podmioty o wyższej płynności i aktywach o obniżonej wartości charakteryzowały się zwykle bardziej pozytywnym tonem. Niniejsze badanie ukazuje innowacyjną perspektywę dotyczącą przyjętej metodologii, będąc pionierskim w obszarze stosowania technologii w badaniu zarządzania wrażeniem w Portugalii. W związku z tym przyszłe analizy mogą wykorzystywać to narzędzie do ograniczania błędów i subiektywności.

Słowa kluczowe: sztuczna inteligencja; sektor bankowy; zarządzanie wrażeniem; listy do akcjonariuszy; manipulacja branżowa.

使用人工智能确定印象管理策略：一项应用于葡萄牙银行业的研究

摘要：本文旨在评估葡萄牙银行业印象管理策略的最终使用情况，特别是如果董事会使用的消息基调可能受到宏观经济、公司治理和经济金融因素的影响。数据来自年度报告，并辅以葡萄牙银行业协会提供的额外财务信息。该总体包括管理委员会从2009年至2017年间在葡萄牙运营的11家银行获得的58条消息。这些信息是使用人工智能工具收集的。研究结果与主题操作策略的识别一致。结果证实，葡萄牙金融部门实体使用的基调符合宏观经济演变，并证实公司治理结构对管理话语产生重大影响。相比之下，公司治理水平较高的实体表现出不那么积极的基调。最后，流动性较高和资产受损的实体往往有更积极的基调。这项研究带来了关于所采用方法的创新视角，在葡萄牙的印象管理研究中开创了技术应用。因此，未来的分析可能会使用这些工具来减少错误和主观性

关键词：人工智能；银行业；印象管理；致股东的信；主题操纵