

Is Risk Disclosure in Banks' Pillar 3 Reporting Informative? Analyzing Tone Consistency with Annual Reports

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Keywords: Annual report, Financial institutions, Pillar 3 report, Risk disclosure, Sentiment analysis, Tone consistency.

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Abstract: We assess the informativeness of tone in risk disclosure by analyzing tone (in)consistency between two main sources of bank reporting: regulatory reports according to the Pillar 3 framework (hereafter P3) and annual reports according to IFRS. Using a sample of European banks from 2008 to 2021, our results indicate that qualitative risk disclosure in P3 reports is informative for banks' capital adequacy and can be used as a benchmark to assess the (in)consistent signal in annual reports. If the tone of P3 reports shifts towards optimism, a consistently positive tone in the annual report will enhance the informativeness of risk disclosure in P3. Conversely, if P3 reports lean towards pessimism, an inconsistent optimistic tone in the annual report will lead to an obfuscation effect on P3 informativeness. The significance of above results depends on the P3 standardization in 2015 and the supervision role of the central bank. Our study provides first evidence regarding the asymmetric effects of tone (in)consistency among different channels of risk disclosure in banks' communications with stakeholders. We conclude that banks' narrative P3 reporting has an incremental effect on its overall informativeness, extending beyond the risk disclosures provided in annual reports.

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1. INTRODUCTION

The 2007–2009 financial crisis exposed a significant shortfall in banks' risk disclosure requirements, which failed to provide comparable and comprehensive information about their risk exposure in financial instruments and capital adequacy. In response, the Basel Committee on Banking Supervision (BCBS) and the International Accounting Standards Board (IASB), as the primary standard setters for European banks' reporting, implemented numerous amendments to the regulatory disclosure framework and accounting standards for financial instruments. In contrast to the standard setters' objectives and efforts, academics criticized banks' risk reporting practices, arguing that they are “increasingly lengthy and poorly integrated” and “non-comparable across exposures, firms, and time” (Ryan, 2012b, p. 299). This aligns with the argument that risk disclosures are boilerplate (Cazier et al., 2021) and fail to be timely (Shabestari et al., 2020). Also, research on the informativeness of risk disclosure provides mixed evidence, emphasizing the need for further research, particularly in a non-US environment (Elshandidy et al., 2018).

To evaluate the informativeness of qualitative risk disclosure, we analyze two types of bank reports: the regulatory report in compliance with Pillar 3 (P3) and the annual report including the risk-related content prepared according to International Financial Reporting Standards (IFRS). While P3 reporting has gained prominence in recent years, research on this topic remains limited compared to the extensive studies focused on banks' annual reports and other alternative information sources (Bischof et al., 2022; Huang et al., 2023). By focusing on the (in)consistency of tone shifts between Pillar 3 and annual reports, our study uses textual analysis to explore divergent tone sentiments in these reports and evaluate the effectiveness of Pillar 3 qualitative risk disclosures in conveying banks' capital adequacy.

The coexistence of P3 regulatory disclosure rules and IFRS accounting standards creates a unique research setting. Despite efforts by the two standard setters to align their requirements (Giner et al., 2020; Bischof et al., 2022), differences remain. Research has shown that the language employed by managers across different disclosure channels can fluctuate based on the degree of their incentives to engage in strategic reporting (Davis and Tima-Sweet, 2012; Feng, 2023). In addition, risk might be assessed and reported differently due to different information recipients (Norman et al., 2010). Research on disclosure consistency has concluded that investors value coherence in information signals, which reduces informational conflicts and eases decision-making (Henry and Peytcheva, 2018). Investors react positively to disclosures with a positive focus and negatively to disclosures with a negative focus (Davis et al., 2015). Given that both reports are based on the same bank's inherent risk profile and level of business complexity, we argue that any tone changes in the reports over two consecutive financial years should exhibit a consistent direction - either positive or negative - if the manager is not engaging in opportunistic reporting behavior. We use the direction of the P3 reports' tone change as a reference point to evaluate the impact of annual report tone changes on P3 informativeness. We predict that if the P3 reporting tone change is towards optimism, a positive tone change in the annual report signals consistent messaging and will enhance the P3 informativeness (consistent signal effect). Conversely, if the tone of P3 reporting shifts toward pessimism while the annual report shifts towards a more positive tone, this signals a conflict or inconsistency in messaging. Such a discrepancy may suggest that managers have alternative incentives, potentially aiming to obfuscate stakeholders and reduce the informativeness of P3 reporting, thereby creating an inconsistent signal effect.

We examine European banks that provide both P3 reports and annual reports according to IFRS to determine if they adjust risk-related information and textual attributes for different audiences, despite both reports being based on the same underlying

fundamentals. We investigate the potential for managers to convey capital adequacy information through the narrative tone in the P3 reports and annual reports. By using P3 reports' tone change direction as a benchmark, we assess the informativeness of P3 disclosures by considering the consistency versus inconsistency of tone changes between the two sources. In this regard, we establish a 2×2 matrix by comparing the tone change in the P3 reports to that in the annual reports.

To measure tone and other textual attributes in relation to risk disclosure, we build upon the work of Dong et al. (2019). They extend the Loughran and McDonald (2011) tone-related dictionary to create a domain-specific one to overcome the limits of applying general dictionaries in specific areas such as banking and risk disclosure (Li, 2010b; Henry and Leone, 2016; Bassyouny et al., 2022; Bochkay, et al., 2023; Huang et al., 2023). The dictionary is based on P3 reports and annual reports provided by publicly listed banks in Europe, as well as Bank of International Settlement (BIS) regulatory documents. We apply this bank-specific dictionary to a paired sample of European bank reports containing 696 P3 reports and 696 annual reports for the financial years from 2008 to 2021. After the data cleaning process considering the key variables, our sample is reduced to a total of 462 observations of pairs of bank reports. We complement tone with other textual attributes such as word count, the Fog index of complexity, and boilerplate (Lang and Stice-Lawrence, 2015). We also control for banks' business model, risk approach under Basel rules, risk exposure, and other bank-specific factors.

As expected, the descriptive statistics show remarkable differences between the tone scores for banks' P3 and annual reports, including many cases of inconsistent tone changes. The results of a preliminary test for the full sample indicate that banks' tone change in P3 reports is marginally positively associated with the changes in banks' capital adequacy. We further conduct similar tests for subsamples with varying tone changes. The results suggest that a shift in P3 narrative tone towards optimism is informative regarding banks' capital

adequacy, while a shift towards pessimism is not. These contrasting findings validate our 2x2 matrix research design, which classifies the reports based on the direction of tone change.

In our first step of main test, we analyze the (in-) consistent signal effect, defined by the positive versus negative tone change in two types of reports - P3 and annual reports - across two consecutive financial years. The results confirm the predicted consistent signal effect if the P3 reporting tone change is towards optimism. We conclude that a consistently positive tone change in the annual report signals consistent messaging between the disclosure in both reports, leading to enhanced informativeness of P3 disclosure. However, we do not find symmetric significant results for the test of an inconsistent signal effect by using the subsample with a negative tone change in the P3 report.

To gain a deeper understanding of the asymmetric effect observed in tone shifts, particularly in the context of positive versus negative changes in banks' specific disclosure requirements, we further examine the relationship between tone (in)consistency and informativeness. This analysis considers the standardization movement initiated by the BCBS in 2015 through its revised Pillar 3 framework (BCBS, 2015). We find evidence of an inconsistent signal effect in relation to managers' obfuscation incentives in banks' reporting before 2015. However, after the revision in 2015, the informativeness of P3 and the inconsistent effect get weakened, which is aligned with the aim of BCBS in standardizing P3 disclosure. Additionally, research has also provided evidence that differences in compliance levels in risk disclosure can be partly attributed to countries' enforcement strength (Adam-Müller and Erkens, 2020, for annual reports of nonfinancial firms; Bischof et al., 2022 for P3 reports of banks). Building upon the insights from Bischof et al. (2022), we find that P3 standardization in combination with central bank supervision can enhance the consistent signal effect. Specifically, in such cases, as consistent positive signals from both sources make the information more compelling and credible, alignment of tone changes in banks'

annual reports and P3 reports can reinforce positive signals from their P3 disclosures, particularly regarding capital adequacy.

This study contributes to the research of banks' risk disclosure and regulatory reporting in various aspects. First, by investigating different disclosure outlets, we conclude that narrative disclosures in P3 reports provide additional informativeness of banks' capital adequacy beyond those offered in corresponding annual reports. However, the informativeness of positive and negative tone changes to reflect capital adequacy is not symmetrical. Secondly, our study takes advantage of the unique European context, utilizing pairs of P3 reports and annual reports. This innovative research design enables us to control for potential interactions between the tones in both reports, addresses endogeneity concerns, and bolsters the strength of our conclusions. Previous research has primarily examined general disclosure in annual reports or one specific risk disclosure without considering potential overlaps in other communication channels (Davis and Tama-Sweet, 2012). Third, our focus on P3 reports of European banks also contributes to our understanding of the informativeness of qualitative risk disclosure in a non-US environment, an area that is so far under-researched (Bassyouny et al., 2022). Finally, we provide evidence related to bank-specific institutional factors, showing that the informativeness of risk disclosure in P3 is affected by the standardization of risk disclosure and the supervision power of the central bank (Bischof et al., 2022). Our results suggest that the P3 standardization can reduce the obfuscation effect stemming from inconsistent signals of tone changes in two reports, and that the standardization of P3 disclosure, together with the central bank supervision can amplify the enhancing consistent signals effect on P3 informativeness.

The rest of the paper is organized as follows. We first describe the institutional background of European banks' risk disclosure, review relevant studies, and develop the hypotheses. We then describe our research design, e.g. how we measure tone and tone

consistency in risk-related disclosures. In Section 3, we provide models for tests, followed by the main analysis and results in Section 4. Our conclusion is given in Section 5.

2. INSTITUTIONAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1. Institutional background: Risk disclosure according to P3 and IFRS

From a regulatory perspective, banks' risk disclosure should improve market discipline (Lobo et al., 2024). In the wake of the 2007–2009 financial crisis it became apparent that the set of disclosure requirements imposed by relevant standard setters for bank reporting failed to provide sufficient, comparable, and comprehensive risk-related information of banks' financial instruments and capital adequacy (Giner et al., 2020). In response, these standard setters revised the rules and introduced new requirements to address these deficiencies.

The Basel II accord is a supranational agreement on the capital regulation of banks. With the third pillar (P3) of the Basel II accord first issued in 2005, the BCBS issued risk disclosure requirements that require firms to publicly disclose information relating to their risks, capital adequacy, and policies for managing risk with the aim of promoting market discipline (BCBS, 2018, p. 1). Most European banks adopting Basel II as of January 2008, published P3 disclosures for the first time for the 2008 financial year.

In 2015, the BCBS presented a revised Basel Pillar 3 standard with the aim to address the problems identified through the financial crisis and to improve comparability and consistency of financial regulatory disclosures. In particular, the standard requires more standardized formats between banks and across jurisdictions. Despite this high level of standardization, the BCBS acknowledges the need to balance mandatory templates with bank managers' flexibility to provide commentary on the bank's specific risk profile (BCBS 2015, p. 1). These disclosure requirements have been implemented in EU law via Part Eight of the Capital Requirement Regulation (CRR, EU No 575/2013). The EBA issued own-initiative

guidelines that do not alter the substance of regulatory disclosures but offer presentational guidance through templates (for disclosure formats), tables (for disclosure organization), and textual instructions (EBA, 2016, p. 6). We therefore consider fundamental changes in the structure and textual attributes of European banks' P3 disclosure after 2015.

In August 2005, the IASB issued IFRS 7 for the first time, which replaced IAS 30 and carried forward the disclosure requirements in IAS 32 Financial Instruments: Disclosure and Presentation. The objective of disclosure under IFRS 7 is to provide stakeholders with relevant information to assess the significance of financial instruments for the entity's financial position and performance, as well as the nature, extent, and management of risks associated with these financial instruments (IFRS 7 paragraph 1). IFRS 7 was first applicable for fiscal years beginning on or after January 1, 2007. According to the IAS Regulation,¹ European banks with listed shares or bonds should provide annual reports in compliance with IFRS from the 2005 financial years (with some exceptions from 2007). The IASB updated IFRS 7 to align with the new standard for financial instruments, IFRS 9, which governs the classification and valuation of financial assets and financial liabilities. Other major amendments of IFRS 7 address disclosure for transferred financial assets in October 2010 and disclosures for netting arrangements in December 2011.² Risk disclosures according to IFRS 7 form an integral part of the audited footnotes to firms' annual reports, enforced by the agency supervising national securities markets (Christensen et al., 2013; Bischof et al., 2022).

In many aspects, the risk disclosure requirements of P3 (and CRR in the EU law) align closely with those of IFRS 7. Even if both standard setters developed the requirements independently, they coordinated efforts (Giner et al., 2020; Bischof et al., 2022). Therefore, a considerable amount of quantitative disclosures overlaps, such as the analyses of credit risk

¹ Regulation (EC) 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of International Accounting Standards (IAS Regulation).

² For the standard's history see the IASB webpage: <https://www.ifrs.org/issued-standards/list-of-standards/ifrs-7-financial-instruments-disclosures/> (last accessed March 27, 2024).

exposures and value-at-risk measures for market risk. Even more, most of the qualitative disclosure requirements regarding the description of credit risk and market risk are comparable.³ Banks have the option to either publish a separate P3 report or to incorporate the disclosures into their annual report. They can fulfill the P3 requirements without additional disclosures if they already provide the necessary risk information in compliance with local accounting standards or regulations (Basel II accord, para. 814). Therefore, the content and aim of the disclosure under both standards are rather comparable (Giner et al., 2020). However, unlike IFRS, the enforcement of P3 falls under the auspices of the national banking supervisor (Bischof et al., 2022).

Bischof et al. (2022) analyze how the presence of multiple supervisory agencies affects firm-level compliance in form and substance with disclosure regulations. They find that banks substantially increase their formal risk disclosures upon the adoption of P3 even if they were already required to comply with similar requirements under IFRS 7. The effects are stronger if the central bank is responsible for banking supervision and bank regulators are equipped with more supervisory resources but are less pronounced if the securities market regulator is an independent entity. In turn, banks facing more market pressures tend to be more compliant with the rules. Therefore, Bischof et al. (2022) highlight an inconsistency in compliance levels between risk disclosures in annual reports and P3 reports. They argue that these inconsistencies can be explained by resources of the supervisory agency and its incentive of aligning with the regulated firms. Christensen et al. (2013) find comparable evidence regarding capital market effects of IFRS adoption and enforcement. They find that changes in reporting enforcement or (unobserved) factors associated with these changes play a critical role for the observed liquidity benefits after mandatory IFRS adoption. Lobo et al. (2024) document a significant reduction in banks' risk-taking following the adoption of IFRS

³ See Bischof et al. (2022), p. 510, for a schematic overview of IFRS 7 and P3 adoption types and pp. 505-507 for a mapping of the disclosure items that are common between P3 and IFRS 7.

7, with the effect being more pronounced when accounting rules are more strictly enforced. Consequently, we anticipate variations in disclosure between the two reports when enforcement levels differ.

2.2. Tone in risk disclosure, informativeness of banks' tone and consistent messaging

A broad body of research on textual sentiment analysis in finance and accounting (see Kearney and Liu, 2014; Loughran and McDonald, 2016; Gandía and Huguet, 2021; Bassyouny et al., 2022; Bochkay et al., 2023) enhances our understanding of how sentiment - typically measured through tone - impacts investors' financial decisions. Bassyouny et al. (2022) review 64 studies on disclosure tone across various financial reporting channels, highlighting a growing research trend in this area. Beyond investor decision-making, we build on the growing body of research examining textual sentiment and tone in bank reporting. Textual tone encompasses not only the polarity of text (positivity or negativity) but also other dimensions such as anxiety, calmness, optimism, and pessimism (Loughran and McDonald, 2016). Information sources include corporate disclosures like annual or quarterly reports, conference calls, analyst forecasts, press releases, and even online and social media content (Gandía and Huguet, 2021, p. 172). In the case of banks, textual disclosures in P3 and annual reports provide a comprehensive view of risk that complements, and sometimes exceeds, the insights offered by quantitative risk measures. Research on banks' qualitative risk disclosure is limited, despite the significant role that risk factor disclosure plays in explaining trends in textual characteristics. These trends include increases in length, boilerplate content, stickiness, and redundancy, along with decreases in specificity, readability, and the relative amount of hard information provided. (Campbell et al., 2014; Hope et al., 2016; Dyer et al., 2017; Cazier et al., 2021; Vasilescu and Weir, 2023, for Brexit risk disclosure). Ryan (2012a; 2012b) concludes that risk disclosures related to financial instruments are often non-comparable, poorly integrated, and excessively boilerplate. In contrast, Lobo et al. (2024) demonstrate that banks' risk disclosures are linked to their risk-taking behavior, suggesting these disclosures

can have tangible real-world effects. We analyze the informativeness of tone and other textual attributes in combination with managerial incentives (Li, 2010a). Campbell et al. (2020) argue that managers face various incentives and biases that can lead to disclosures that are not fully transparent. As these incentives and biases become more pronounced, the tone of disclosures tends to show less variation, resulting in more boilerplate content. Therefore, the degree of tone volatility can indicate the extent to which a manager's disclosures transparently reflect the firm risk. Davis and Tima-Sweet (2012) show that managerial language in earnings press releases versus MD&A disclosures varies with their strategic incentives. Similarly, Fisher et al. (2020) find significant tone differences across narrative types. Norman et al. (2010) reveal that internal auditors assess and report fraud risks differently depending on the audience, such as management or audit committees. Thus, we hypothesize that tone is used differently in reports intended for distinct recipients, like shareholders and regulators.

As the Basel framework mainly serves to govern banks' capital adequacy, we hypothesize that managers have the incentive to communicate information regarding regulatory capital adequacy to stakeholders through the tone of risk disclosure in P3. Specifically, when a bank experiences an improvement in its capital adequacy, managers may choose to convey this positive development through a more optimistic tone in their risk disclosures, aiming to elicit favorable responses from stakeholders. Consequently, we expect that positive tone changes in the P3 report will be positively associated with changes in the bank's capital adequacy ratio. Based on this reasoning, we propose our first hypothesis:

H1: Bank's tone change in the P3 report is informative for bank's regulatory capital adequacy.

The coexistence of accounting standards and regulatory disclosure rules offers a unique opportunity to explore whether bank managers tailor qualitative information for different audiences, holding all other factors constant. When comparing tone changes between P3 and annual reports, any differences in tone cannot be attributed to risk, forecasts,

profitability, or other variables, as both reports reflect the same organization and time period. We interpret the role of tone consistency as a signaling device (Falk and Zimmermann, 2017) covering incremental information (Chou et al., 2018). The theory of ambiguity states that individuals prefer to avoid informational conflicts in their decision-making, which we define as inconsistent signals (Ellsberg, 1961). E.g. Henry and Peytcheva (2018) demonstrate that investors exhibit a greater capacity to discern performance differences among companies when there is a lower level of inconsistency between qualitative and quantitative indicators within earnings reports. Social sciences provide a framework to analyze inconsistent messaging: e.g. politicians should avoid inconsistencies in their messaging, what is sometimes called “waffling” or “flip-flopping” (Hummel, 2010). More generally, inconsistent messaging creates a credibility gap. In the context of capital market disclosure, investors place a high value on coherence in information signals, such as consistency between quantitative and qualitative disclosures. This coherence reduces informational conflicts and facilitates decision-making (Henry and Peytcheva, 2018). There are only a few studies addressing the role of consistency in disclosure. Brown and Tucker (2011), analyzing MD&A disclosure over time, conclude that textual consistency in the 10-K represents a valid and economically meaningful risk signal. Conversely, boilerplate language and reporting complexity tend to increase with higher risk levels, making it more challenging for investors to identify and accurately interpret risk-related signals. Feng (2023) provides evidence for tone dissonance between the Q&A section of conference calls and the MD&A section of the related 10-Ks. Building on these findings, we investigate whether tone (in)consistency between P3 reports and annual reports reveals additional insights into the qualitative information disclosed.

From the aspect of information complexity, Bushee et al. (2018) argue that textual attributes can also reflect the provision of complex information. Consequently, text attributes commingle two latent components - obfuscation and information - that are related to information asymmetry in opposite directions. Loughran and McDonald (2016) identify the

same empirical challenge concluding “researchers face the problem of separating the business and the document. These issues are intertwined because the document attempts to describe the economic reality of the business” (p. 1198). To address this empirical challenge, DeHaan et al. (2021) propose a specific research methodology that can distinguish between complexity that is intentionally manipulated and complexity that arises from inherent variations among funds. We borrow from this idea anticipating that both reports - the P3 report and the annual report - are describing the same business unit with the same levels of riskiness and complexity. We propose that if the manager is not reporting opportunistically, the description of the nature of business riskiness and complexity in both reports should align, resulting in tone changes moving in the same direction - either positive or negative. Therefore, inconsistent tone changes between the two reports might suggest other reporting strategies such as obfuscation. In this regard, we establish a benchmark by comparing the tone change in the P3 reports to that in the annual reports. This responds to Bassyouny et al. (2022), who called for research on tone consistency across different channels of disclosure in companies' communications with stakeholders. If a bank maintains a consistent tone across these channels, it is expected to enhance the informativeness of the tone, thereby reinforcing the conveyed message. With this context, we introduce our second hypothesis:

H2: The consistent positive tone change in the annual report will reinforce the informativeness of positive tone change in the P3 report.

Addressing inconsistent messaging, particularly in cases where there is a negative tone change in P3, we expect potential strategic messaging in annual reporting.⁴ We assume that the regulator, as the main information recipient of P3, is more capable of processing complex information than the average equity investor. This argument is consistent with research confirming that retail investors are more prone to sentiment misuse in financial disclosure

⁴ In Appendix F, we present three cases with negative changes in capital ratios despite overall positive statements in annual reports.

(Baginski et al., 2018). We therefore expect a higher level of change in tone and other textual attributes in annual reports compared to that in P3 reports, if banks employ strategic messaging in annual reporting. Research investigating the relationship between textual attributes and accounting fraud find that fraudulent firms produce verbal disclosure that is abnormal relative to strong counterfactuals. E.g., Hoberg and Lewis (2017) find evidence showing that fraudulent managers discuss fewer details explaining the sources of firm's performance, while disclosing more favorable information of firm performance. In addition, there is evidence that disclosure might be unnecessarily complex because of strategic incentives to shroud information. In the same vein, Reichmann (2023) finds that tone management in the MD&A is positively associated with future stock price crash risk. This body of research generally views the use of complex language as a deliberate strategy by managers to obfuscate information, thereby increasing processing costs and delaying market reactions to news (e.g., Jin et al., 2022). Consequently, it is plausible that fraudulent firms exhibit an atypical inclination toward using optimistic language in their annual reports as opposed to the language found in their P3 reports. In other words, bank managers may have been more prone to use positive narrative tones in annual reports to counterbalance negative signals from P3 disclosures. These conflicting signals make it harder for stakeholders to assess the company's capital adequacy accurately. With this argument, we can formulate H3.

H3: The inconsistent positive tone change in the annual report will obscure the informativeness of negative tone change in the P3 report.

Next, we argue that the revised P3 standards by the BCBS in 2015 change the structure and textual attributes of European banks in P3 reporting. As described in section 2.1., these standards in combination with the EBA guidelines provide a standardized disclosure format for banks to present their risk exposure in relation to the regulatory capital, which might limit the managers' incentives and willingness of voluntary disclosure. Literature in corporate disclosure report that voluntary and mandatory disclosure might diverge,

depending upon whether a firm's disclosure alters the other firm's real cash flow or the investors' perceptions about cash flows of other firms (Dye, 1990, for risk disclosure Heinle and Smith, 2017). This argument seems to be more applicable for highly regulated industries such as banking, so that the disclosure policy of one bank will generate "information transfers" among banks. Alternatively, Bagnoli and Watts (2007) address the complementary versus substitute relation between voluntary and mandatory disclosure. They argue that the change in standard mandatory disclosure can affect managers' willingness to provide supplemental voluntary disclosure. Both arguments lead to our prediction that the informativeness of banks' narrative tone change can be affected by the level of disclosure standardization, such as after the introduction of the revised P3 standards in 2015. Considering these institutional factors, we predict that the standardization of risk disclosure will impact its informativeness. Therefore, we develop the following hypothesis:

H4: Standardization will affect the informativeness of bank's tone change in the P3 report.

3. RESEARCH DESIGN

3.1. Sample

For the construction of the bank's specific sentiment dictionary, we hand-scraped from financial institutions' websites a sample containing banks' annual reports and P3 reports for the financial years 2007-2016, accompanied by regulatory documents published by the Bank for International Settlements (BIS) as suggested by Dong et al. (2019). In total, we gathered 2,053 bank annual reports and P3 reports, and 372 BIS documents. After the creation process, we finalized a list containing 531 positive terms and 641 negative terms. Appendix A provides more details on how we created bank-specific lists of positive and negative terms, which, when considered together, define tone.

The sources of our textual analysis are European banks' P3 reports and annual reports, both in PDF format. We use the Wondershare PDF Password Remover and convert PDFs into

ASCII text files by programmatically calling from Python the XPDFBIN program pdftotext. Textual analysis proceeds in the programming language Python. We first choose all European banks for the financial years 2008-2021, in total 4,281 banks, because most European banks adopted Basel II as of January 2008, and published P3 disclosures for the first time for the 2008 financial year. We reduce our sample by excluding banks that are non-listed banks and listed subsidiaries while their parent is also listed, and that don't provide IFRS reports according to the database of Capital IQ and ORBIS, etc. We finally identified 245 European banks that provide both P3 reports and IFRS annual reports. The sample selection process is shown in Table 1 Panel A.

Insert Table 1 here

In our next step, we construct a paired sample of P3 reports and annual reports to control for the complexity of banks' risk disclosure as explained above. This reduces our sample but allows for a cleaner research design. First, we remove those reports that are not qualified for our analysis. This is the case, if the report is not available in English, the accounting standard cannot be identified as IFRS, or there is no pdf document available for either P3 reports or annual reports. After a final cleaning procedure, e.g., excluding reports that do not contain text and, therefore, no sentiment (tone) information, we identify a final paired sample containing 696 P3 reports and 696 annual reports. Detailed information on the pairing process is provided in Table 1, Panel B.

3.2. Tone (in)consistency

In this step, we aim to measure the consistency or inconsistency of tone changes between paired annual reports and P3 reports for the same bank within the same financial years. First, we assess the tone of each report by calculating the discrepancy between the positive and negative language used. This tone measurement captures the overall sentiment conveyed in each report (For a detailed explanation of tone measurement, see Section 3.3).

Next, for each type of report - Pillar 3 report and annual report - we calculate the tone change by comparing the tone from one financial year to the next, thus determining how the tone has shifted across two consecutive years. This approach aligns with Kravet and Muslu (2013) and Li (2010a), who recommend using change specifications in textual analysis to mitigate endogeneity concerns. Due to the non-continuous nature of our dataset, calculating changes in tone scores requires the availability of tone data for two consecutive years, which reduces the sample further. At this stage, we obtained a paired sample comprising 577 observations, representing a total of 88 banks (see Table B1 for the geographical distribution). We define change as:

$$Change_{r,i,t} = \begin{cases} \text{Positive,} & \text{if } Tone_{r,i,t} > Tone_{r,i,t-1}, \\ \text{Negative,} & \text{if } Tone_{r,i,t} < Tone_{r,i,t-1}. \end{cases}$$

Where r represents the P3 report (denoted by P3) or the annual report (denoted by AR), banks get an index i , with i ranging from 1 to n , and a time index for the financial year with t running from 2008 to 2021.

Once we have calculated the tone change for the paired P3 report and annual report, we then compare these tone changes to assess consistency. Consistency is defined as both reports exhibiting tone changes in the same direction (either both becoming more positive or both becoming more negative), while inconsistency is defined as the reports showing tone changes in opposite directions (one becoming more positive and the other more negative). This approach allows us to systematically analyze the alignment or divergence in narrative tone between these two key disclosure outlets.

We define tone consistency as:

$$Tone\ consistency = \begin{cases} 1, & \text{if } P3\ Change_{r,i,t} \text{ is of the same sign as } AR\ Change_{r,i,t}, \\ 0, & \text{otherwise.} \end{cases}$$

When the *Tone consistency* variable takes the value 1 (0), we call the P3 and AR narrative tone changes consistent (inconsistent). Table 2 presents the classification of paired P3 reports and annual reports based on the direction of tone changes observed in each report

type over two consecutive financial years. To maintain a reasonable variation in our key variable of interest - P3 tone change - we only used observations with a P3 *tone change ratio* higher than 5% and deleted observations with missing financial data. This reduces our sample to a total of 462 observations of pairs of bank reports. Interestingly, we observe 217 cases of inconsistency (B and C) and 245 cases of consistency (A and D) between the tone changes in paired P3 reports and annual reports. While the number of inconsistent cases is less than that of consistent cases, the proportion of inconsistencies is still significant and noteworthy. This already indicates that inconsistent messaging might be used as a signal to reveal managers' opportunistic communication.

Insert Table 2 here

3.3. Measures of tone and textual attributes

To determine relevant textual scores, we analyze the entire P3 report because the whole text is expected to capture risk-related information. In contrast, for annual reports, we use “risk” as a keyword to extract risk-related content. More specifically, we first find paragraphs containing the keyword “risk” and tag them as “risk paragraph”. Next, we extract three paragraphs above and below the “risk paragraph”, respectively. So, all these paragraphs define our risk-related content.⁵ Based on these texts, we calculate the following variables:

Tone. Following Li (2010a), we introduce *PosTone* and *NegTone*. We first calculate the proportion of positive or negative words in each paragraph, expressed as a fraction of the total words in that paragraph. Then, *PosTone* or *NegTone* is the average of these proportions over all paragraphs within the risk disclosure text. The overall tone of the document (*Tone*) is measured as the difference between *PosTone* and *NegTone*, reflecting the discrepancy between positive and negative language used.

⁵ Compared to the entire annual reports, we exclude 43% of the words and 49% of the paragraphs because they do not cover risk-related information.

Word_count. This is the natural log of the number of words contained in each risk disclosure text.

Paragraph. This is the number of paragraphs in the relevant text.

FOG. This is a standard measure for measuring readability in financial disclosures and reflects the length of a sentence and the sophistication of words (Loughran and McDonald 2014).

Boilerplate. Boilerplate corresponds to the use of generic text in risk disclosure of annual and P3 reports, suggesting that the disclosure is less informative, everything else being equal. The construction of *boilerplate* follows rigorously the algorithm proposed by Lang and Stice-Lawrence (2015).⁶

In our regression analysis, we compute the average of each textual attribute between the paired reports and take the logarithm of these averaged measures.

3.4. Descriptive statistics

In Table 3 Panel A, we present summary statistics of the measures as defined in Section 3.3 for the full paired sample before deleting observations with a P3 tone change ratio smaller than 5% and the observations with missing financial data. Appendix B shows their geographical and temporal sample distribution covering banks from 24 European countries with reports from 2008 to 2021. The descriptive statistics demonstrate that *tone* conveyed by P3 reports and risk disclosure in annual reports are fundamentally different. The annual reports' risk *tone* is generally more positive than the P3s' *tone*. Indeed, a notable divergence emerges when comparing banks' P3 reports with the full text of annual reports, specifically with regard to the non-risk-sensitive sections.⁷ However, even if we focus on risk-related content in annual reports, *tone* in annual reports maintains a more optimistic trend compared

⁶ For the computation of *boilerplate*, which involves 4 grams, also called tetragrams, we used the Python package ngrams.

⁷ Comparing the entire annual report to just risk-related content the average tone reduces from 0.7012 to 0.4141 by about 41%.

to P3 reports. This suggests that banks tailor their communication style in annual reports primarily to the main recipients e.g., investors rather than regulators. Our descriptive statistics reveal that the *tone* in P3 reports exhibits a higher level of variability, as evidenced by a higher standard deviation, when compared to the *tone* in annual reports. In addition, the sections that contain risk-related information in annual reports are longer and, therefore, show a higher *word count* and more *paragraphs* compared to those in P3 reports. In alignment with our expectations of divergent information recipients, annual reports exhibit a more pronounced presence of boilerplate language (*boilerplate*). However, contrary to initial assumptions, simple t-tests (not tabulated) do not indicate statistically significant differences in several textual attributes such as *FOG* and *boilerplate*. Due to the substantial correlation between *word count* and *paragraph*, we include only *word count* in our regressions.

Insert Table 3 here

An analysis of the time series (not tabulated) shows that on average, *tone* is increasing during the sample period, indicating that bank reports express a more positive sentiment over time.

3.5. MODELS

To test H1, we examine whether tone change in P3 reports' disclosure is informative for the change in banks' capital adequacy. We proxy banks capital adequacy by two ratios: Common Equity Tier 1 Capital Ratio (*CET1*) and Tier 1 Capital Ratio (*Tier1*).⁸ *CET1* is defined as:

$$CET1 = 100 \times \text{Common Equity Tier 1 Capital} / \text{Risk Weighted Assets}$$

⁸ Under Article 92 of the CRR, EU banks must meet the following minimum capital requirements: Common Equity Tier 1 Ratio of 4.5%, Tier 1 Capital Ratio of 6%, and Total Capital Ratio of 8%. In addition, banks must meet the capital requirements set on an annual basis following the Supervisory Review and Evaluation Process (SREP) conducted by local central banks. As additional control, we also use the Tier 2 Capital Ratio as a proxy for capital adequacy. The results are shown in Appendix E.

where *CET1* refers to the bank's core equity capital, which includes common shares and retained earnings minus certain deductions. Risk-Weighted Assets are the assets of the bank adjusted for credit, market, and operational risk. *Tier1* is defined as:

$$Tier1 = 100 \times Tier\ 1\ Capital / Risk\ Weighted\ Assets$$

where *Tier1* includes the most reliable and permanent forms of capital, which typically consist of common equity and certain qualifying non-cumulative (dividend) preferred stock.

In the following, we use *Capital Ratio* to represent either one of the two capital adequacy measures just introduced. We apply the following Model (1) to test H1:

$$\begin{aligned} \Delta Capital\ Ratio_{t,i} &= \Delta Tone_{t,a,i} + \Delta Tone_{t,p,i} + FOG_{t,r,i} + Boilerplate_{t,r,i} + Word_count_{t,r,i} + BTM_{t,i} + \\ &SEC_{t,i} + LOAN_{t,i} + IRB_{t,i} + Size_{t,i} + Year\ fixed\ effect + \varepsilon_{t,i} \end{aligned} \quad \text{Model (1)}$$

Where banks get an index i , with i ranging from 1 to n , and a time index for the financial year with t running from 2008 to 2021. $\Delta Tone_{t,a,i}$ or $\Delta Tone_{t,p,i}$ is the tone change since last year of an annual report (a) or a P3 report (p). We denote by r the average value of a textual attribute as measured in both P3 report (p) and the annual report (a). For instance, if the Fog index is 10 in the Annual Report (a) and 20 in the Pillar 3 (p) report, we calculate the average Fog index between the two reports (r) as $(10 + 20) / 2 = 15$. The indices remain constant for the following model specifications. We control for other textual attributes such as complexity (*FOG*), content (*Boilerplate*) and report length (*Word_count*).

For bank-specific factors that may affect banks' capital adequacy ratio, we consider the book-to-market ratio (*BTM*), fair-valued securities scaled by total assets (*SEC*), loan over total assets (*LOAN*), and bank size (*Size*) measured as the natural log of total assets. Prior studies used these variables to capture banks' growth, to distinguish investment banks from others with traditional business models, and to identify other bank-specific fundamentals. Moreover, we control for the approach of measuring credit risk (IRB versus standardized approach) that banks apply for calculating the risk-weighted assets (RWA) associated with credit risk. Prior

studies concluded that banks' choice of applying either the IRB or the standard approach is one of the fundamental factors that may explain banks capital adequacy ratio (i.e., Dong and Oberson, 2022). The descriptive statistics of the dependent variables and bank characteristics are shown in Table 3, Panel B. We report the correlation matrix in Appendix C.

Next, we refer to our tone (in)consistency matrix (Table 2) and examine whether the tone consistency in the P3 reports (P3) and annual reports (AR) will affect their informativeness of banks' capital adequacy change. To test H2 we apply the following Model (2) to examine whether consistent positive tone change in the annual report will reinforce the informativeness of the positive tone change in the P3 report for subgroups A and C.

$$\begin{aligned} & \Delta Capital Ratio_{t,i} \\ & = \Delta Tone_{t,a,i} + \Delta Tone_{t,p,i} + positive_consistency_{t,i} + \Delta Tone_{t,p,i} \times \\ & positive_consistency_{t,i} + FOG_{t,r,i} + Boilerplate_{t,r,i} + Word_count_{t,r,i} + BTM_{t,i} + \\ & SEC_{t,i} + LOAN_{t,i} + IRB_{t,i} + Size_{t,i} + Year\ fixed\ effect + \varepsilon_{t,i}. \end{aligned} \quad \text{Model (2)}$$

In H3, we refer to our tone (in)consistency matrix (Table 2) and test the cases of negative tone change in P3 classified as subgroups B and D. We apply the following Model (3) to examine when the tone change in the P3 report is negative, whether an inconsistent tone change in the annual report will affect the informativeness in banks' regulatory capital.

$$\begin{aligned} & \Delta Capital Ratio_{t,i} \\ & = \Delta Tone_{t,a,i} + \Delta Tone_{t,p,i} + Inconsistency_{t,i} + Inconsistency_{t,i} \times \Delta Tone_{t,p,i} + FOG_{t,r,i} + \\ & Boilerplate_{t,r,i} + Word_count_{t,r,i} + BTM_{t,i} + SEC_{t,i} + LOAN_{t,i} + IRB_{t,i} + Size_{t,i} + \\ & Year\ fixed\ effect + \varepsilon_{t,i}. \end{aligned} \quad \text{Model (3)}$$

Where all the variable definitions are the same as in Models (1) and (2) except the variable of inconsistency. In Model (3), the tone $Inconsistency_{t,i}$ takes 1 if the change of tone in AR is positive while the change of tone in P3 is negative, 0 otherwise.

In H4 we test whether the banks' tone is less informative after the revision of P3 disclosure rules in 2015 that standardizes banks' risk disclosure. To do so, we use the year 2015 as a benchmark to split the sample into two groups - before standardization in 2015 and after standardization in 2015 - and re-run models (1)-(3) by groups.

4. RESULTS

4.1 Informativeness and (in-) consistency of tone change in P3 reports (H1-H3)

Table 4 presents our tests of H1, H2, and H3. Columns 1 and 2 of Table 4 report the results of model (1) for the full sample (cases A, B, C, D). Consistent with our prediction, the coefficient of $\Delta Tone_{P3}$ with respect to $\Delta CET1$ is 0.043 with a standard error of 0.019, significant at the 5% level, suggesting that banks' tone change in P3 is positively associated with the changes of banks' *CET1*. This effect is economically significant: a standard deviation (3.7030) increase in P3 tone change from its mean is associated with an increase of $\Delta CET1$ by 0.1596 percentage points for the full sample, reflecting the informativeness of P3 tone change. Even though the coefficient of $\Delta Tone_{P3}$ with respect to $\Delta Tier1$ is insignificant, it shows, however, a positive sign. The lack of strong significance for these variables in Columns 1 and 2 might be explained by the presence of nonlinearities, potentially influenced by the direction of the tone change.

Insert Table 4 here

We investigate the impact of the direction of the tone change by analyzing the two subsamples classified by positive versus negative tone change in P3. Columns 3-4 and 5-6 report the results of model (1) for the two subsamples with positive (cases A, C) versus negative (cases B, D) tone changes in P3. The results in Columns 3 and 4 versus Columns 5 and 6 are remarkably contrasting. When the tone change of P3 reports becomes positive, the results in Columns 3 and 4 show that both capital adequacy ratios are positively associated with $\Delta Tone_{P3}$. Differently, then the P3 tone change is negative, the results in Columns 5 and

6 show that a P3 negative tone change lacks significant informativeness regarding banks' capital adequacy. In contrast to the insignificance of $\Delta Tone_{P3}$, in such cases, tone changes in annual reports, $\Delta Tone_{AR}$, present significant positive informativeness.

However, this insignificance of $\Delta Tone_{P3}$ might be caused by the change in capital ratio, especially if the bank's capital adequacy ratio conveys a high level of capital buffer or if its change is minimal. The descriptive statistics in Table 3, Panel B, indicate that banks in our sample exhibit a broad variation in capital ratios. To investigate these alternative explanations, we perform regressions corresponding to Columns 5 and 6 of Table 4, focusing only on those observations where the capital ratio belongs to the lowest quartile and when changes in the capital ratio are in the most negative quartile (untabulated). We find that the informativeness of P3 tone change becomes marginally significant when the change in the capital ratio belongs to the lowest quartile. We therefore conclude that the insignificant $\Delta Tone_{P3}$ coefficients reported in Columns 5 and 6 of Table 4 primarily pertain to sample banks that demonstrate low change in their capital adequacy ratios. In such cases, tone changes in annual reports, $\Delta Tone_{AR}$, present significant positive informativeness in contrast to the insignificance of $\Delta Tone_{P3}$, suggesting that the tone of risk disclosure in annual reports becomes informative, offering bank's capital adequacy insights to stakeholders, even when specific disclosures in P3 highlight risk concerns.

Collectively, the informativeness of tone change in P3 reports and annual reports exhibits an intriguing asymmetric pattern depending on the direction of the tone change in P3 reporting. To investigate this further, we introduce two dummy variables (*positive consistency and inconsistency*) to indicate if the tone changes of both reports are of the same sign.

Columns 7 and 8 of Table 4 display the results of model (2) for testing H2 – whether the positive consistency in tone changes of P3 and AR disclosure reinforces the informativeness of tone changes in P3 reports, which extend Columns 3 and 4. When the tone change in P3 is positive (cases A and C), $\Delta Tone_{P3}$ conveys positive informativeness in banks'

capital adequacy (coefficient of $\Delta Tone_{P3}$ with respect to CET1 = 0.0707, significant at the 1% level). The significant positive coefficient for the interaction variable *Positive consistency* $\times \Delta Tone_{P3}$ further indicates that positive informativeness of $\Delta Tone_{P3}$ is enhanced when the tone change in the annual report is consistently positive (= 0.2111 for $\Delta CET1$). In other words, a consistently positive tone change in the annual report enhances and reinforces the informativeness of P3 tone change regarding banks' capital adequacy. This enhancing effect reflects managers' disclosure incentive, as consistent positive signals from both sources makes the information more compelling and credible, leading to a stronger perception of improved capital adequacy.

Next, we study the conflicting signals from two reporting sources by testing H3, which addresses the inconsistency of tone changes between the P3 report and the annual report. As negative tone change might indicate concerns or potential weaknesses while positive tone change attempts to convey optimism or strength. Inconsistent tone changes between a bank's two main reports can lead to confusion or create obfuscation among its stakeholders. To test this, we include only the samples with negative tone changes in P3 (cases B and D). The results of model (3) for the inconsistent signal tests are reported in Columns 9 and 10 of Table 4. The coefficients of $\Delta Tone_{P3}$ and the interaction effects (*Inconsistency* $\times \Delta Tone_{P3}$) are insignificant for both capital adequacy ratios. These results suggest that when banks turn to apply more negative words in P3 reporting, using optimistic tone in annual reporting does not diminish the informativeness of P3 in banks' capital adequacy. Rather, the coefficient of $\Delta Tone_{AR}$ as in columns 5 and 6 of Table 4 remains highly significant, indicating that tone change in annual reports is informative for banks' capital adequacy.

In conclusion, our results support H1, indicating that tone changes in P3 reports convey valuable information about banks' capital adequacy, particularly when the tone shifts are positive. The results for H2 indicate that when P3 reporting becomes optimistic, a consistent positive tone change in the annual report will reinforce the informativeness of P3 in

banks' capital adequacy. Conversely, in cases where banks experience negative tone changes in P3 reporting, the moderation effect of inconsistent positive signal in annual reports, as predicted by H3, does not attain statistical significance. Instead, the individual informativeness of positive tone changes in annual reports exhibits statistical significance, indicating that bank managers might strategically communicate information regarding capital adequacy through the positive tone in annual reporting, while P3 tone change does not have informativeness - a potential obfuscation effect in banks' dual reporting facing different recipients.

4.2 Informativeness and P3 standardization

Building on the findings from our first three hypotheses - specifically, that tone changes in P3 reports provide informative insights into banks' capital adequacy and that consistent tone signals in annual reports enhance P3 informativeness - H4 explores whether the standardization introduced by the BCBS's revised P3 framework in 2015 impacts the results of H1-H3. The results, presented in Columns 1 and 4 of Table 5, Panel A, extend H1.

Insert Table 5 here

We divide the sample into two periods: before P3 standardization in 2015 (Columns 1 and 2) and after 2015 (Columns 3 and 4), and apply model (1) to both subsamples. Consistent with H1, tone changes in P3 reports show a positive relationship with capital adequacy ratios, particularly pronounced before 2015 when disclosure standardization was lower. Post-2015, however, the informativeness of P3 tone changes is no longer significant. These findings support H4 and align with the BCBS's 2015 revisions aimed at enhancing transparency and comparability in banks' P3 disclosures. H4 also services the robustness of our findings for H2 and H3. We use the subsamples with positive and negative tone changes in P3 reports and introduce 2015 as a benchmark year to identify different standardization levels. The results of Columns 1-4 in Table 5 Panel B are derived from model (2) as an extent to H2. The insignificant coefficients of *Positive Consistency* × $\Delta Tone_{P3}$ in four regressions show that the

revision of the P3 framework does not affect the reinforcing effect of tone consistency. This is contrary to the prediction formulated in H4. That is, the consistent signal effect of the annual report tone change on P3 tone informativeness may not be robust across different regulatory environments. This could imply that the effect observed in the sample of positive tone change in P3 (Columns 7 and 8 of Table 4) may not be solely due to standardization but could also be influenced by other factors. To explore this further, we will study regulatory factors in Section 4.3.

The results in Columns 5-8 of Table 5, Panel B, are based on model (3) as an extension of H3. We also split the cases of Groups B and D into periods of pre-standardization in 2015 and post-standardization in 2015. Results show a remarkable contrast with those obtained earlier in the main tests (Columns 9 and 10 in Table 4). When P3 tone change is negative, the inconsistently positive tone changes in the annual report will reduce the informativeness of P3 in reflecting banks' capital adequacy during the pre-2015 period (the coefficients of $Inconsistency \times \Delta Tone_{P3}$ with respect to $\Delta CET 1$ and $\Delta Tier 1$ are -1.773 and -1.783 respectively, significant at the 1% level). This result is supportive of our hypothesis that when risk disclosures are less standardized and potentially more reliant on narrative tone for interpretation, conflicting signals make it harder for stakeholders to assess the company's capital adequacy accurately. In this period, bank managers may have been more prone to use obfuscated positive narrative tones in annual reports to counterbalance negative signals from P3 disclosures. Interestingly, after 2015, this adverse obfuscation effect of annual reports' inconsistent tone on P3 informativeness is no longer significant. This indicates that the standardization effectively mitigates the issues caused by conflicting signals. Under the scenario of negative P3 tone change signaling potential issues or concerns regarding risk, with more standardized and transparent reporting, stakeholders may have become less influenced by narrative tone discrepancies, focusing more on the quantitative aspects of the disclosures.

Overall, our findings offer partial support for H4. The standardization of P3 has enhanced the clarity and reliability of risk reporting, thereby reducing the reliance on narrative tone for interpreting risk in P3 reports. Additionally, it mitigates the obfuscation effect caused by inconsistent signals between annual reports and P3, improving the overall informativeness of P3 disclosures.

4.3. Further Analysis

We consider P3 to also provide a disclosure framework that enables national supervisors to impose constraints on banks' risk exposure. The impact of P3 standardization may vary depending on the supervisory environment. In our further analysis, we examine the role of central bank supervision in the context of our H4 findings. Bischof et al. (2022) find that “banks strengthen compliance with Pillar 3 if the country’s central bank acts as their primary supervisor (instead of a special financial services authority).” To test this with our data, we split our sample into two subgroups (1) banks supervised by central banks and (2) banks not supervised by central banks.

Insert Table 6 here

We re-estimate model (2) and model (3) for subsamples grouped by central bank supervision and P3 standardization. Table 6, Panel A, displays the result of the consistent signal effect of annual report tone change on P3 informativeness considering the P3 standardization and central bank supervision. As a supplementary finding to Table 5, Panel B, the consistent signal effect in the cases of A and C (Columns 7 and 8 of Table 4) is not driven solely by the standardization, but is influenced by the combination of standardization and central bank supervision (the coefficients of $Positive\ consistency \times \Delta Tone_{P3}$ with respect to $\Delta CET1$ and $\Delta Tier\ 1$ are 1.360 and 1.334, significant at the 1% level as shown in Columns 3&4 of Table 6 Panel A). It suggests that even though BCBS (2015) and its transposition into

European law require that European banks should use the fixed format templates defined by EBA for qualitative and quantitative risk disclosure, bank managers still have discretion in conveying capital adequacy information through positive tone change in both reports. Banks under central bank supervision post-2015 might be more strategic in their communication, knowing that their disclosures are closely monitored. The positive interaction term could indicate that the alignment of tone between the two reports reinforces positive signals from their P3 disclosures, particularly regarding capital adequacy, in an environment where credibility is paramount. This highlights the importance of a robust regulatory framework in enhancing the reliability and informativeness of risk disclosures, with central bank supervision playing a critical role in ensuring that the narrative tone aligns meaningfully with the quantitative measures reported.

Table 6, Panel B, displays the result of model (3) to test the inconsistent signal effect of annual reports' tone change on P3 informativeness considering the P3 standardization and central bank supervision. Probably because of the limited sample size, when the P3 tones tend to negatively change, whatever bank we take, with or without central-bank supervision, before or after 2015, an inconsistent positive tone change in annual reports has no impact on the informativeness of P3 tone change to reflect banks' capital adequacy.

Taken together, under the environment of central bank supervision in combination with P3 standardization, the annual reports' tone change plays a more critical role in shaping the interpretation of P3 positive risk disclosures, specifically regarding capital adequacy. In this situation, consistent positive signals from both annual report and P3 are more likely to be viewed as credible and meaningful by stakeholders, including regulators, investors, and analysts – as they ensure information alignment of narrative tones between two sources.

5. CONCLUSION

In this study, we use tone - quantified as the difference between the frequency of positive and negative wordings - to assess the informativeness of banks' reporting in both the P3 and annual reports. Specifically, we analyze paired samples of these reports to address endogeneity concerns (Li, 2010b; Kravet and Muslu, 2013) and to highlight the distinct insights provided by these two main sources of banks' risk information. Our findings contribute to the growing body of research on the informativeness of tone across different disclosure channels (Kearney and Liu, 2014; Loughran and McDonald, 2016; Gandía and Huguet, 2021; Bassyouny et al., 2022), with a particular focus on European banks' P3 reporting (Elshandidy et al., 2018). Unlike prior studies, we focus on a special aspect of banks disclosure – tone (in)consistency in banks' risk communication through different disclosure outlets to various stakeholders. Our results indicate that tone changes in annual reports and P3 reports convey information on banks' capital adequacy. We find that negative versus positive tone changes in P3 are not informative in the same way. Their effect on banks' capital adequacy should be analyzed and interpreted separately. On the one hand, when P3 reports become optimistic, the tone changes in P3 have informativeness in conveying capital adequacy. In such cases, anchoring on the theory of consistent messaging (Falk and Zimmerman, 2017), we predict and find that a consistently positive signal in the annual report will reinforce the informativeness of the P3 narrative tone. On the other hand, when P3 reports become pessimistic, tone changes in annual reports present significant positive informativeness. It suggests that annual reports may provide valuable information to stakeholders about banks capital adequacy, even when P3 disclosure highlights risk concerns. In such cases, we do not find the inconsistent signal effect of the annual report's optimistic tone on the informativeness of P3 tone. We argue that the signaling effect in banks reporting depends on their specific regulatory regime, which may influence how managers engage in risk disclosure between P3 and annual report tones to convey information.

Our last hypothesis addresses this issue and considers the regulation environment change in January 2015 when BCBS revised the P3 framework with the aim of enhancing the transparency, comparability, and consistency of capital adequacy disclosures. Based on this, we further study whether standardization of P3 disclosure might change the informativeness of banks' tone and the (in)consistent signal effect. We find that the introduction of disclosure guidance in 2015 reduces the informativeness of P3 tone change for the full sample, which is aligned with the initiatives launched by BCBS in January 2015. For the subsample tests based on the different directions of P3 tone change, we find that when P3 becomes pessimistic, the inconsistent tone signal by the annual report reduces the informativeness of P3 tone change before the introduction of P3 standardization, and after P3 standardization, this inconsistent signal effect disappears. It suggests that standardization effectively mitigates the obfuscation issues caused by conflicting signals. Additionally, when P3 becomes optimistic, we don't find a significant consistent signal effect, whether before or after P3 standardization. After we take the supervision levels into account (Bischof et al., 2022), we find that under the regulation environment of the combination of central bank supervision and P3 standardization, the alignment of tone between the two reports enhances the informativeness of the P3 report in reflecting capital adequacy.

This research has some limitations. First, we employ a specific paired sample design to address banks' dual regulatory reporting, which reduces our sample size, as banks that combine P3 reporting with their annual reports are excluded. Second, despite using a sophisticated banking-specific dictionary, our methodology relies on the stability of this dictionary and certain assumptions inherent in textual analysis, such as the bag-of-words and additivity assumptions. Third, while our analysis focuses on risk-related disclosures, changes in the tone of non-risk-related reporting may also offer valuable insights into banks' capital adequacy. Finally, our study examines tone changes and capital adequacy over a one-year period, yet the effects of banks' reporting may unfold and persist over longer time horizons.

Despite these constraints, our study advances the existing literature on banking by providing the first empirical evidence that, beyond annual reporting, P3 is a critical information source for understanding banks' risk-related disclosures. A consistent positive tone change between banks' P3 reports and annual reports serves as a reinforcing signal, indicating enhanced P3 informativeness regarding banks' capital adequacy, particularly under central bank supervision and P3 standardization. Therefore, the significance of P3 reporting should not be underestimated.

Our study also contributes to disclosure literature by confirming the importance of tone in narrative analysis, irrespective of reporting types (Fisher et al., 2020). Additionally, we examine the informativeness of tone within the specific context of banking, taking into account the roles of supervision and the P3 standardization process. Our findings align with the EBA's interpretation of the role and objectives of P3 disclosure requirements, as outlined by Wilms (2014): *“The objective of Pillar 3 is not so much to inform market participants but to act as a deterrent to banks. Pillar 3 essentially assumes that, when aware their behavior is being monitored, banks will anticipate market expectations and adjust their behavior accordingly”* (Wilms, 2014, p.4). In this sense, the informativeness of P3 is not solely determined by the disclosure itself, but by the effectiveness of supervision power and market discipline.

Future research could explore banks in different jurisdictions, examine various types of specific risk disclosures, analyze market reactions to changes in the tone of banks' reporting, and incorporate other disclosure outlets. This would help to further develop our understanding of the role and consequences of banks' risk disclosures in the context of multiple regulatory frameworks.

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TABLES

Table 1: Selection of relevant banks and pairing process

Panel A: Selection of relevant banks

		Number of Banks
SNL: Europe, banking, listed or non-listed, operating companies or acquired/defunct, full or summary coverage depth, excluded parents/subsidiaries, consolidation, financial years 2008-2021		4281
Banks without LEI or ISIN code	-571	3710
No match in ORBIS database*	-63	3647
Listing status: Non-listed** or missing value	-3157	490
Listed subsidiaries while its parent is also listed	-85	405
Listed period data in Capital IQ	+13	418
Banks not providing IFRS reports	-79	339
Banks excluding non-EU or non-EEA***	-94	245

* Orbis database provides the delisted date. ** Listing status: listed, delisted, un-listed. *** Including the United Kingdom and Switzerland.

Panel B: Pairing process

	Pillar 3 report (P3)	Annual report (AR)
Number of banks	245	245
Minus: banks without qualified reports*	148	85
Nbr. banks with qualified reports	97	160
Nbr. qualified reports	787	1565
Nbr. paired reports P3 and AR	696	696

*Qualified reports: ENGLISH, IFRS, PDF, after running the text extraction and cleaning process, the number of words is more than 1000.

Table 2: Cases of tone (in-)consistency between P3 reports (P3) and annual reports (AR):

final paired sample (n = 462)

	Positive Tone Change in P3	Negative Tone Change in P3	Σ n
Positive Tone Change in AR	<i>Tone positive consistent (A) = 135</i>	<i>Tone inconsistent (B) = 100</i>	235
Negative Tone Change in AR	<i>Tone inconsistent (C) = 117</i>	<i>Tone negative consistent (D) = 110</i>	227
Σ n	252	210	462

Note: The reports counted here correspond to a situation where tone change varies by more than 5%.

Table 3: Descriptive statistics: full paired sample (n = 577)*Panel A: Descriptive statistics of textual attributes*

P3 reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	-0.8609	0.7042	-3.4940	-1.3160	-0.8777	-0.3809	1.6400
<i>FOG</i>	15.7407	1.9355	12.0604	14.4108	15.3393	16.9100	24.3257
<i>Word_count</i>	27,495	20,315	1,144	13,253	23,434	36,464	137,200
<i>Paragraph</i>	549	396	29	271	473	710	2,498
<i>Boilerplate</i>	40.5514	9.7230	1.2460	33.8980	38.2500	47.0420	95.9460
Annual reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	0.4141	0.6730	-6.5835	-0.0582	0.3892	0.8213	2.5992
<i>FOG</i>	13.8724	1.2441	11.6787	12.9501	13.6143	14.7671	19.3259
<i>Word_count</i>	53,332	38,818	199	24,963	41,660	71,679	280,400
<i>Paragraph</i>	885	576	7	459	718	1,152	3,189
<i>Boilerplate</i>	42.6399	9.1244	1.9220	35.3860	42.4470	49.3430	63.4570

Note: The descriptive statistics of scores before the transformation, such as $\log(x)$. See Table 7 for variable definition.

Panel B: Descriptive statistics of dependent variables and bank characteristics

Variable	Mean	SD	Min	p25	p50	p75	Max	N
Δ CET1	0.3285	2.0101	-11.1509	-0.4562	0.3373	1.2869	7.6256	462
Δ Tier1	0.4428	2.1848	-12.0478	-0.5023	0.4392	1.4547	10.1566	462
Δ Tier2	0.4639	2.2867	-13.7516	-0.5704	0.4434	1.5371	10.1566	462
CET1	14.5180	3.6367	6.6288	12.0939	14.0386	16.6785	30.8288	462
Tier1	15.9009	4.0485	7.5605	13.2263	15.6003	17.7385	41.6776	462
Tier2	17.9295	3.8579	9.4319	15.4235	17.4457	20.0358	41.6776	462
Δ Tone _{P3}	-0.2615	3.7030	-38.1698	-0.2901	0.0766	0.3007	46.7193	462
Δ Tone _{AR}	-1.3063	22.6781	-372.3979	-0.3248	0.0201	0.5147	105.7640	462
BTM	0.0855	0.0397	0.0116	0.0594	0.0756	0.1025	0.2679	462
SEC	0.3234	0.3790	0.0000	0.0005	0.1058	0.6993	1.1392	462
LOAN	0.5655	0.1561	0.0485	0.4675	0.5720	0.6679	0.9133	462
IRB	0.6429	0.4797	0.0000	0.0000	1.0000	1.0000	1.0000	462
Size	374,300	545,100	1,009	19,125	73,625	552,700	2601000	462

Note: The descriptive statistics of above variables before natural logarithm transformation. See Table 7 for variable definition.

Table 4: Informativeness and (in-) consistency of tone change in P3 (H1-H2-H3)

	Full sample		Positive change in P3 ¹		Negative change in P3 ²		Positive change in P3 ¹		Negative change in P3 ²	
	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET	Δ Tier 1
Regression number	1	2	3	4	5	6	7	8	9	10
Δ Tone _{P3}	0.0431** (0.0185)	0.0264 (0.0247)	0.0812*** (0.0224)	0.0764*** (0.0191)	0.0130 (0.0201)	-0.0128 (0.0292)	0.0707*** (0.0203)	0.0652*** (0.0165)	-0.0015 (0.0217)	-0.0283 (0.0381)
Δ Tone _{AR}	0.0017 (0.0041)	0.0021 (0.0041)	-0.0037 (0.0139)	-0.0149 (0.0160)	0.0056*** (0.0019)	0.0061*** (0.0019)	-0.0029 (0.0137)	-0.0138 (0.0154)	0.0055*** (0.0019)	0.0059*** (0.0018)
Positive Consistency							-0.1287 (0.3364)	-0.1488 (0.3591)		
Positive consistency $\times\Delta$ Tone _{P3}							0.2111** (0.0950)	0.2231** (0.1102)		
Inconsistency									0.1936 (0.2887)	0.3445 (0.3460)
Inconsistency $\times\Delta$ Tone _{P3}									0.0309 (0.0421)	0.0316 (0.0570)
FOG	-0.6189 (0.8793)	-0.5913 (0.9547)	0.2518 (1.1910)	-0.6825 (1.3495)	-0.8195 (1.5142)	0.3309 (1.9106)	0.2707 (1.2098)	-0.6613 (1.3690)	-0.7393 (1.4450)	0.3663 (1.8385)
Boilerplate	0.2244 (0.3756)	0.4352 (0.3640)	-0.1456 (0.3944)	0.0470 (0.4257)	0.8175 (0.8728)	1.2699 (1.0803)	-0.1124 (0.4004)	0.0820 (0.4324)	0.7640 (0.8483)	1.2450 (1.0778)
Word_count	0.2648 (0.1785)	0.3304** (0.1623)	0.4175 (0.3513)	0.4018 (0.4154)	-0.0351 (0.2458)	0.0768 (0.4257)	0.4083 (0.3548)	0.3929 (0.4185)	-0.0303 (0.2417)	0.0989 (0.4173)
BTM	0.4905** (0.1939)	0.3070 (0.2507)	0.7213** (0.3113)	0.7713** (0.3599)	-0.0054 (0.3424)	-0.5474 (0.6535)	0.7432** (0.3195)	0.7934** (0.3748)	-0.0275 (0.3353)	-0.5948 (0.6628)
SEC	-0.1066 (0.3338)	0.2279 (0.4992)	0.3003 (0.4688)	0.2698 (0.5351)	-0.6457 (0.5291)	0.1897 (0.7358)	0.2188 (0.4715)	0.1843 (0.5341)	-0.6580 (0.5271)	0.1547 (0.7136)
LOAN	-1.0446 (0.7364)	-1.2802* (0.7006)	-1.1347 (1.0390)	-0.9827 (1.0980)	-0.8747 (1.0998)	-1.4423 (1.1307)	-1.1765 (1.0557)	-1.0327 (1.0984)	-0.8848 (1.1173)	-1.4360 (1.1531)
IRB	0.4773* (0.2570)	0.3707 (0.2358)	0.6573 (0.4405)	0.8189 (0.4920)	0.2849 (0.4940)	-0.2088 (0.6801)	0.7237* (0.4154)	0.8907* (0.4643)	0.2700 (0.5058)	-0.2494 (0.7083)
Size	-0.0452 (0.0992)	-0.0790 (0.0989)	-0.0433 (0.1578)	-0.0433 (0.1662)	-0.0089 (0.1552)	-0.0522 (0.2175)	-0.0336 (0.1556)	-0.0336 (0.1626)	-0.0177 (0.1537)	-0.0667 (0.2128)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	462	462	252	252	210	210	252	252	210	210
Adjusted R Square	0.1110	0.0787	0.1750	0.1790	0.0945	0.0417	0.1720	0.1760	0.0876	0.0372

Note: *** p<0.01, ** p<0.05, * p<0.1. Cluster standard errors at bank level. ¹ Use the subsample of Group A&C. ² Use the subsample of Group B&D. See Table 7 for variable definition.

Table 5: Informativeness and P3 standardization in 2015 (H4)**Panel A: Informativeness of P3 tone change by standardization (an extension to H1)**

	Full sample Before 2015		Full sample After 2015	
	Δ CET 1	Δ CET 1	Δ Tier 1	Δ Tier 1
Regression number	1	2	3	4
Δ Tone _{P3}	0.0864*** (0.0200)	0.0854*** (0.0213)	0.0318 (0.0243)	0.0050 (0.0337)
Δ Tone _{AR}	0.0030 (0.0045)	0.0033 (0.0044)	-0.0234 (0.0146)	-0.0158 (0.0173)
Controls	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	146	146	316	316
Adjusted R Square	0.0649	0.1040	0.1190	0.0539

Panel B: (in)consistent signal effect of AR tone change on P3 informativeness by standardization (an extension to H2 and H3)

	Positive change in P3 ¹ Before 2015		Positive change in P3 ¹ After 2015		Negative change in P3 ² Before 2015		Negative change in P3 ² After 2015	
	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1
Regression number	1	2	3	4	5	6	7	8
Δ Tone _{P3}	0.0973*** (0.0227)	0.0974*** (0.0217)	-0.0143 (0.4488)	-0.0148 (0.4489)	1.3735*** (0.4200)	1.6902*** (0.5276)	0.0072 (0.0214)	-0.0277 (0.0406)
Δ Tone _{AR}	0.0264 (0.0247)	-0.0176 (0.0239)	-0.0112 (0.0132)	-0.0046 (0.0142)	0.0079*** (0.0024)	0.0094*** (0.0029)	-0.0333 (0.0299)	-0.0385 (0.0320)
Positive Consistency	-0.3972 (0.9218)	-0.2152 (0.9189)	-0.2737 (0.3777)	-0.3764 (0.3780)				
Positive consistency $\times\Delta$ Tone _{P3}	1.4842 (2.2102)	1.0864 (2.0749)	0.3039 (0.4474)	0.3379 (0.4546)				
Inconsistency ³					-0.5371 (0.7049)	-0.5178 (0.8178)	-0.0064 (0.3438)	0.2952 (0.4260)
Inconsistency $\times\Delta$ Tone _{P3}					-1.7730*** (0.5288)	-1.7834*** (0.5042)	0.0241 (0.0451)	0.0304 (0.0605)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	80	80	172	172	66	66	144	144
Adjusted R Square	0.1210	0.1660	0.1450	0.1380	0.2281	0.2387	0.0449	-0.0153

Note: *** p<0.01, ** p<0.05, * p<0.1. Cluster standard errors in bank level. ¹ Use the subsample of Group A&C. ² Use the subsample of Group B&D. ³Negative change of tone in the P3 report yet a positive change of tone in the annual report. See Table 7 for variable definition. Controls are all the additional variables which figure in Table 4

Table 6: Informativeness and the role of supervision (further analysis of H4)

Panel A: consistent signal effect of AR tone change on P3 informativeness by standardization (an extent to H2) combining with central bank supervision								
Positive change in P3 ¹	Central Bank Supervision				No Central Bank Supervision			
	Before 2015		After 2015		Before 2015		After 2015	
	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1
Regression number	1	2	3	4	5	6	7	8
Δ Tone _{P3}	0.0862 (0.0534)	0.1009** (0.0468)	-1.0340** (0.3931)	-0.9260** (0.4362)	-1.0159 (1.4929)	-1.9313 (1.7224)	-0.0304 (0.5017)	-0.0888 (0.5197)
Δ Tone _{AR}	-0.0121 (0.0433)	-0.0275 (0.0425)	-0.0101 (0.0137)	0.0005 (0.0137)	0.0264 (0.0761)	-0.1170 (0.0876)	0.0328 (0.0615)	0.0084 (0.0607)
Positive Consistency	-0.5367 (1.1525)	-0.2773 (1.0993)	-0.7497 (0.5276)	-0.9039* (0.4913)	-1.1461 (0.9289)	-0.3390 (1.0313)	-0.2124 (0.5531)	-0.1017 (0.5734)
Positive consistency $\times\Delta$ Tone _{P3}	-1.3294 (2.8235)	-1.3494 (1.9838)	1.3602*** (0.4249)	1.3342*** (0.4629)	6.8153 (3.8905)	5.4150 (3.6620)	0.2835 (0.4975)	0.3221 (0.5156)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	43	43	104	104	37	37	68	68
Adjusted R Square	0.0482	0.1429	0.1537	0.1488	0.3533	0.4155	0.1284	0.1469

Panel B: inconsistent signal effect of AR tone change on P3 informativeness by standardization (an extent to H3) combining with central bank supervision								
Negative change in P3 ²	Central Bank Supervision				No Central Bank Supervision			
	Before 2015		After 2015		Before 2015		After 2015	
	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1	Δ CET 1	Δ Tier 1
Regression number	3	4	5	6	7	8	9	10
Δ Tone _{P3}	-0.3401 (0.4683)	-0.1466 (0.8770)	-0.0229 (0.0217)	-0.0485 (0.0437)	2.6658** (1.2014)	3.4961*** (1.0621)	0.1764 (0.1700)	0.0208 (0.3299)
Δ Tone _{AR}	0.0079** (0.0030)	0.0077** (0.0035)	-0.0462 (0.0460)	-0.0606 (0.0536)	0.0160 (0.1529)	0.1660 (0.2538)	-0.0690 (0.0464)	-0.0757* (0.0424)
Inconsistency ³	0.5520 (0.5997)	0.1847 (1.3421)	0.0060 (0.3497)	0.5476 (0.6310)	0.4118 (1.1724)	1.0181 (1.3867)	-0.5461 (0.6960)	-0.3579 (0.7393)
Inconsistency $\times\Delta$ Tone _{P3}	-0.1439 (0.5051)	-0.4814 (0.9737)	0.0787 (0.0773)	0.0765 (0.0888)	-1.7058 (1.8044)	-0.7807 (1.7457)	-0.2079 (0.1648)	-0.1143 (0.3354)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	33	33	74	74	33	33	70	70
Adjusted R Square	0.2888	0.0790	0.0449	-0.0247	0.6354	0.6624	0.0310	0.0116

Note: Cluster standard errors in bank level. ¹ Use the subsample of Group A&C. ² Use the subsample of Group B&D. ³ Negative change of tone in the P3 report yet a positive change of tone in the annual report. See Table 7 for variable definition.

Table 7: List of variables' labels and definitions

Label	Definition	Note
<i>Dependent variables</i>		
ΔCET1	Change of CET 1 ratio	CET 1 ratio = Common Equity Tier 1 ratio. See section 4.
ΔTier1	Change of Tier 1 ratio	See also section 4.
ΔTier2	Change of Tier 2 ratio	
<i>Independent variables</i>		
Tone	Difference of PosTone and NegTone	As defined in section 3.2
Consistency	The changes of tone in AR and P3 reports are consistent	Dummy variable taking the value 1 if the changes of tone in AR and P3 reports are consistent.
Group A: Positive consistency	The changes of tone in AR and P3 reports are consistent positively	Dummy variable taking the value 1 if the changes of tone in AR and P3 reports are consistent positively.
Group D: Negative consistency	The changes of tone in AR and P3 reports are consistent negatively	Dummy variable taking the value 1 if the changes of tone in AR and P3 reports are consistent negatively.
Group B: AR positive & P3 Negative	The change of tone in AR is positive while the change of tone in P3 is negative	Dummy variable taking the value 1 if the change of tone in AR is positive while the change of tone in P3 is negative.
Group C: AR Negative & P3 Positive	The change of tone in AR is negative while the change of tone in P3 is positive	Dummy variable taking the value 1 if the change of tone in AR is negative while the change of tone in P3 is positive
ΔTone	Change of Tone	
<i>Textual Scores</i>		
FOG	Natural log of the FOG index	For regression: $FOG = \text{Log}((FOG_{AR} + FOG_{P3})/2)$
Boilerplate	Natural log of Boilerplate	For regression: $Boilerplate = \text{Log}((Boilerplate_{AR} + Boilerplate_{P3})/2)$
Word-count	Natural log of Word-count	For regression: $Word-count = \text{Log}((Word-count_{AR} + Word-count_{P3})/2)$
Paragraph	Natural log of Paragraph	
<i>Control Variables</i>		
BTM	Natural log of book to market ratio	Book value of equity over market cap plus liabilities minus book value of equity
SEC	Securities at fair value divided by the total securities	Financial securities held at fair value over total securities
LOAN	Loans over total assets	Total loans and finance leases outstanding over total assets
IRB	Internal rating-based approach	Dummy variable taking the value 1 if bank uses an internal rating model and 0 otherwise
Size	Natural log of total assets	
Central Bank supervision	Banking supervision	Dummy variable taking the value 1 if the central bank is responsible for banking supervision

Appendices

A *A bank specific sentiment dictionary*

Here, we describe how the bank-specific lists of positive and negative terms were created as suggested by Dong et al. (2019) which, when considered together, define tone. The Loughran and McDonald (2011) vocabulary of both positive and negative wording is specific to company disclosures and may not be relevant for banks. Basically, for the sample of all banks listed on European stock exchanges in 2016, we obtained the annual and P3 reports for all the years covering 2007-2016. We also collected all regulatory documents published by the Bank for International Settlements (BIS) on its website. In total, we gathered 2,053 bank annual reports and P3 reports and 372 BIS documents. We transformed those documents from PDF into ASCII text files. In the next step, we searched for double negations in our reporting sources. Consistent with Loughran and McDonald (2012), we find that this feature is not relevant and can be ignored in the context of banking. Then, after the usual tokenization and stopword filtering,⁹ we counted the frequency of appearance of various words in the reports. Following Li (2010a), our dictionary covers not only single words but also consecutive ones, so called n-grams. Next, we bypass stemming, which consists of breaking down a word to its root (Loughran and McDonald, 2012). At this stage, we generate counts of words appearing in at least 20% of the texts, resulting in an initial list of 8,884 words. From this list we extracted those that are related to negative and positive tones. Comparison of our list of words with the existing dictionary of Loughran and McDonald (2011),¹⁰ revealed a rather small intersection of words. Ultimately, concerning tone, we retained a list of 531 positive terms and 641 negative ones.

⁹ Examples of stopwords are 'then', 'on', 'here', 'but', 'is'. We used the software package nltk for this task.

¹⁰ We obtained these data from http://www.nd.edu/~mcdonald/Word_Lists.html, which appears to have migrated since we downloaded the data to <https://sraf.nd.edu>.

B Geographical and temporal sample distribution

Table B1: Geographical sample distribution

Country	Freq.	Percent	Number of Banks	Country	Freq.	Percent	Number of Banks
United Kingdom	101	17	13	France	14	2.36	3
Italy	74	12.46	12	Ireland	14	2.36	3
Denmark	52	8.75	4	Austria	13	2.19	4
Spain	43	7.24	5	Finland	13	2.19	4
Poland	39	6.57	4	Netherlands	10	1.68	4
Sweden	34	5.72	4	Hungary	7	1.18	1
Switzerland	33	5.56	4	Bulgaria	5	0.84	1
Greece	29	4.88	3	Liechtenstein	3	0.51	1
Belgium	23	3.87	2	Lithuania	3	0.51	1
Norway	22	3.7	7	Slovenia	3	0.51	1
Germany	20	3.37	2	Iceland	2	0.34	1
Cyprus	19	3.2	3	Malta	1	0.17	1
				Total	577	100	88

Table B2: Temporal sample distribution

Year	Freq.	Percent
2008	9	1.56
2009	22	3.81
2010	26	4.51
2011	31	5.37
2012	29	5.03
2013	32	5.55
2014	32	5.55
2015	41	7.11
2016	50	8.67
2017	54	9.36
2018	61	10.57
2019	58	10.05
2020	67	11.61
2021	65	11.27
Total	577	100

C Correlation Matrix

Table C1: Correlation matrix

	$\Delta CET1$	$\Delta Tier1$	$\Delta Tier2$	$\Delta Tone_{P3}$	$\Delta Tone_{AR}$	FOG	Boilerplate	Word count	Paragraph	BTM	SEC	LOAN	IRB	Size
$\Delta CET1$	1													
$\Delta Tier1$	0.910***	1												
$\Delta Tier2$	0.835***	0.917***	1											
$\Delta Tone_{P3}$	0.0680	0.0270	-0.00100	1										
$\Delta Tone_{AR}$	0.0360	0.0370	0.079*	0.000	1									
FOG	-0.0110	0.0160	0.00600	-0.00300	-0.00300	1								
Boilerplate	-0.00800	0.0270	0.0120	0.0140	-0.0390	0.551***	1							
Word count	0.0390	0.0430	0.0520	-0.0380	0.00700	-0.117**	-0.158***	1						
Paragraph	0.0500	0.0470	0.0550	-0.0470	0.00800	-0.241***	-0.241***	0.942***	1					
BTM	0.0230	0.0140	0.0170	-0.0600	0.0100	0.234***	0.207***	-0.288***	-0.266***	1				
SEC	-0.097**	-0.0490	-0.0740	0.0300	0.00100	0.0510	0.0410	0.296***	0.259***	0.095**	1			
LOAN	-0.0700	-0.0730	-0.0580	-0.0150	-0.0120	0.00100	0.0680	-0.138***	-0.123***	0.218***	0.099**	1		
IRB	0.085*	0.0540	0.0540	0.0440	-0.0560	-0.331***	-0.309***	0.484***	0.523***	-0.381***	0.127***	0.0350	1	
Size	0.093**	0.0670	0.0580	0.00700	-0.0170	-0.304***	-0.373***	0.691***	0.724***	-0.459***	0.100**	-0.311***	0.709***	1

Note: The pairwise correlation coefficients of above variables after transformation, such as logit transformation for CSCM, natural logarithm transformation for FOG. See Table 7 for variable definition.

D Split sample between reports before and after the new disclosure guidance of the EBA regarding standardization of risk disclosure in 2015

Table D1: Descriptive statistics for split sample of reports before 2015 (N=181)

P3 reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	-1.0047	0.6171	-3.4940	-1.3618	-0.9317	-0.6138	0.3621
<i>FOG</i>	15.5843	1.7128	12.0697	14.2287	15.3061	17.1275	20.6443
<i>Word count</i>	23,360	17,825	1,144	8,956	20,165	32,492	92,056
<i>Paragraph</i>	450	315	29	197	413	622	1,527
<i>Boilerplate</i>	38.1848	7.8043	24.5350	32.1480	36.6250	43.3090	58.5500
Annual reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	0.3067	0.5552	-0.7162	-0.0861	0.1829	0.6068	2.0189
<i>FOG</i>	13.8177	1.1022	11.8555	13.0360	13.7956	14.5366	16.3153
<i>Word count</i>	46,818	34,170	8,817	20,300	33,130	60,350	145,300
<i>Paragraph</i>	794	548	193	395	588	1,030	2,620
<i>Boilerplate</i>	43.1244	8.5689	28.2410	35.3660	43.4530	48.2820	60.8500

See Table 7 for variable definition

Table D2: Descriptive statistics for split sample of reports after 2015 (N=396)

P3 reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	-0.7951	0.7320	-3.0625	-1.2857	-0.8459	-0.2683	1.6400
<i>FOG</i>	15.8121	2.0272	12.0604	14.4431	15.3587	16.7842	24.3257
<i>Word count</i>	29,385	21,109	1,471	14,672	25,679	38,650	137,200
<i>Paragraph</i>	595	421	33	305	507	736	2,498
<i>Boilerplate</i>	41.6331	10.3131	1.2460	34.6510	38.9780	48.9475	95.9460
Annual reports	Mean	SD	Min	p25	p50	p75	Max
<i>Tone</i>	0.4632	0.7157	-6.5835	-0.0062	0.4609	0.8849	2.5992
<i>FOG</i>	13.8974	1.3045	11.6787	12.9117	13.5429	14.8432	19.3259
<i>Word count</i>	56,309	40,460	199	27,669	44,131	74,303	280,400
<i>Paragraph</i>	927	584	7	497	765.5	1,209	3,189
<i>Boilerplate</i>	42.4185	9.3695	1.9220	35.5945	42.1165	49.6700	63.4570

See Table 7 for variable definition.

Table E1: Informativeness to reflect Tier 2 Ratios and (in-) consistency of tone change in P3 (H1-H2-H3)

	Capital adequacy				
	Full Sample	Positive change in P3 ¹	Negative change in P3 ²	Positive change in P3 ¹	Negative change in P3 ²
	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2
	1	2	3	4	5
Δ Tone _{P3}	0.009 (0.026)	0.0637*** (0.0210)	-0.029 (0.028)	0.0539*** (0.0199)	-0.0276 (0.0383)
Δ Tone _{AR}	0.006 (0.007)	-0.0230 (0.0209)	0.012*** (0.003)	-0.0229 (0.0209)	0.0116*** (0.0031)
Positive Consistency				-0.0690 (0.3467)	
Positive consistency \times Δ Tone _{P3}				0.2122* (0.1243)	
Inconsistency ³					0.4268 (0.3691)
Inconsistency \times Δ Tone _{P3}					-0.0071 (0.0493)
Other textual scores	Yes	Yes	Yes	Yes	Yes
Banks characteristics	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observation	462	252	210	252	210
Adjusted R Square	0.0700	0.1730	0.0591	0.1690	0.0584

Note: Cluster standard errors in bank level. ¹Use the subsample of Group A&C, ²Use the subsample of Group B&D, ³ Negative change of tone in the Pillar report yet positive change of tone in the Annual report. See Table 7 for variable definition.

Table E2: Informativeness to reflect Tier 2 Ratios and P3 standardization in 2015 (H4)

	Capital adequacy					
	Full sample Before 2015	Full sample After 2015	Positive change in P3 ¹ Before 2015	Positive change in P3 ¹ After 2015	Negative change in P3 ² Before 2015	Negative change in P3 ² After 2015
	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2
	1	2	3	4	5	6
Δ Tone _{P3}	0.0939*** (0.0241)	-0.0143 (0.0314)	0.1032*** (0.0323)	-0.0216 (0.4184)	1.6349** (0.6663)	-0.0264 (0.0404)
Δ Tone _{AR}	0.0080 (0.0077)	-0.0117 (0.0174)	-0.0211 (0.0295)	-0.0128 (0.0183)	0.0139*** (0.0024)	-0.0156 (0.0318)
Positive Consistency			-0.0357 (0.8849)	-0.2760 (0.4045)		
Positive consistency $\times\Delta$ Tone _{P3}			-0.0781 (2.1595)	0.3586 (0.4357)		
Inconsistency ³					0.0024 (0.9820)	0.2595 (0.4198)
Inconsistency $\times\Delta$ Tone _{P3}					-1.8540*** (0.5666)	-0.0114 (0.0497)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observation	146	316	80	172	66	144
Adjusted R Square	0.0863	0.0676	0.1585	0.1406	0.1826	0.0075

Note: Cluster standard errors in bank level. ¹Use the subsample of Group A&C, ²Use the subsample of Group B&D, ³ Negative change of tone in the Pillar report yet positive change of tone in the Annual report. See Table 7 for variable definition.

Table E3: Informativeness to reflect Tier 2 and the role of supervision (further analysis of H4)

Panel A: Consistent signal effect of AR tone change on P3 informativeness by standardization (an extent to H2) combining with central bank supervision				
	Central Bank Supervision		No Central Bank Supervision	
	Positive change in P3 ¹ Before 2015	Positive change in P3 ¹ After 2015	Positive change in P3 ¹ Before 2015	Positive change in P3 ¹ After 2015
	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2
Regression number	1	2	3	4
Δ Tone _{P3}	0.1424** (0.0616)	-0.9615** (0.3794)	-1.3155 (2.1630)	-0.1401 (0.5269)
Δ Tone _{AR}	-0.0369 (0.0680)	-0.0088 (0.0151)	-0.1323 (0.0974)	0.0048 (0.0668)
Positive Consistency	0.0794 (1.3833)	-0.7127 (0.5382)	-0.8410 (1.4772)	-0.3648 (0.6027)
Positive consistency $\times\Delta$ Tone _{P3}	-1.7471 (2.4681)	1.3280*** (0.4419)	6.1748 (3.9325)	0.4842 (0.5503)
Controls	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	43	104	37	68
Adjusted R Square	-0.1048	0.2081	0.2161	0.0862
Panel B: inconsistent signal effect of AR tone change on P3 informativeness by standardization (an extent to H3) combining with central bank supervision				
	Central Bank Supervision		No Central Bank Supervision	
	Negative change in P3 ² Before 2015	Negative change in P3 ² After 2015	Negative change in P3 ² Before 2015	Negative change in P3 ² After 2015
	Δ Tier2	Δ Tier2	Δ Tier2	Δ Tier2
Regression number	1	2	3	4
Δ Tone _{P3}	-0.7731 (0.9739)	-0.0552 (0.0443)	4.1661** (1.5098)	0.0505 (0.3119)
Δ Tone _{AR}	0.0111** (0.0047)	-0.0566 (0.0493)	0.0511 (0.3439)	-0.0491 (0.0417)
Inconsistency ³	1.5614 (1.5953)	0.7544 (0.5881)	0.8329 (2.0155)	-0.6457 (0.7080)
Inconsistency $\times\Delta$ Tone _{P3}	0.1488 (1.2622)	0.0312 (0.0672)	-2.3471 (2.8072)	-0.1417 (0.3150)
Controls	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	33	74	33	70
Adjusted R Square	0.2294	0.0011	0.5458	0.0865

Note: Cluster standard errors at the bank level.¹ Use the subsample of Group A&C.² Negative change of tone in the Pillar report yet a positive change of tone in the Annual report.³ Use the subsample of Group B&D. See Table 7 for variable definition.

F *Examples for illustrating the use of tone in bank reports*

To illustrate, we provide three examples with negative changes in capital ratios but overall positive tone in annual reports:

Table H1: The informativeness of tone consistency and supervisor

Bank	Negative changes in capital ratios	Positive Score(%)	Negative Score(%)	Tone(%)
Example 1: Banca Sistema S.p.A.	> minimum capital requirements	0.433	0.216	0.216
Example 2: Banca IFIS S.p.A.	M&A with a positive expectation	5.208	4.167	1.042
Example 3: Hellenic Bank Public Company Limited	CET Tier 1 < minimum capital requirements	4.895	0.699	4.196

See Table 7 for variable definition.

Example 1: The capital ratio of Banca Sistema S.p.A. in 2017 decreased compared to it in 2016 but the statement about its capital adequacy in its annual reports is relatively positive.

Synopsis: red - positive statements, green -negative statements, yellow highlighting: positive words in our lists, green highlighting: negative words in our list

OWN FUNDS (€,'000) AND CAPITAL RATIOS	31/12/2017	31/12/2016
Common Equity Tier 1 (CET1)	125,767	104,621
ADDITIONAL TIER 1	8,000	8,000
Additional Tier 1 capital (AT1)	133,767	112,621
TIER2	28,239	12,092
Total Own Funds (TC)	162,006	124,713
Total risk weighted assets	1,058,017	788,041
of which, credit risk	909,012	652,999
of which, operational risk	143,487	130,447
of which, market risk	2,402	4,595
of which, CVA	3,116	-
Ratio - CET1	11.9%	13.3%
Ratio - AT1	12.6%	14.3%
Ratio - TCR	15.3%	15.8%

“The Own funds totalled 162 million, against risk-weighted assets of 1,058 million, derived almost **exclusively** from credit risk. Based on article 467(2) of the CRR, implemented by the Bank of Italy in Circular 285, the Bank adopted the option to exclude, from its own funds, unrealised **gains** or **losses** related to loans and receivables with the Central Authorities classified in the Available-for-sale financial assets (AFS) category. The effects of said exclusion on the capital ratios are marginal. As at 31 December 2017, the Banca Sistema Group presented a CET1 capital ratio equal to 11.9%, a Tier 1 capital ratio equal to 12.6% and a Total capital ratio of 15.3%.” (Annual report 2017, page 148)

“2018 following the outcome of the Supervisory Review and Evaluation Process (SREP). The capitalization requirements, according to the transitory criteria, are as follows:

- CET1 ratio of 7.125% + additional +0.75% **above** the minimum regulatory requirement,
- TIER1 ratio of 8.875% + additional +1.0% **above** the minimum regulatory requirement,
- Total capital ratio of 11.225% + additional +1.35% **above** the minimum regulatory requirement.” (Annual report 2017, page 30)

Example 2: The capital ratio of Banca IFIS S.p.A. decreased in 2017 compared to 2016. However, the statement regarding its capital adequacy in the annual reports indicates a relatively positive trend.

Own funds and capital adequacy ratios

OWN FUNDS AND CAPITAL ADEQUACY RATIOS:(in thousands of Euro)	AMOUNTS AT	
	31.12.2017	31.12.2016 RESTATED
Common equity Tier 1 Capital ⁽¹⁾ (CET1)	859.944	1.038.232
Tier 1 Capital (T1)	898.356	1.055.719
Total own funds	1.191.097	1.079.100
Total RWA	7.376.606	7.013.074
Common Equity Tier 1 Ratio	11,66%	14,80%
Tier 1 Capital Ratio	12,18%	15,05%
Total Own Funds Capital Ratio	16,15%	15,39%

(1) Common Equity Tier 1 capital includes the profit for the period net of estimated dividends.

Meanwhile, the Common Equity Tier 1 ratio, which amounted to 11,66%, was negatively affected by the decline in the proportion of eligible minority interests, in accordance with Art. 84 of the CRR, as well as the higher deduction applied to the increase in deferred tax assets that rely on future profitability and do not arise from temporary differences. However, this deduction will be gradually absorbed by the future use of such deferred tax assets, in line with the reasonable expectation that the positive trend in the Group's profitability will continue, as explained in the following paragraph "Outlook". (Annual report 2017, page 129)

Example 3: The capital ratio of Hellenic Bank Public Company Limited in 2011 decreased compared to it in 2010 but the statement about its capital adequacy in its annual reports is relatively positive.

The table below presents the position of the Group's regulatory capital, in accordance with the principles of Basel II, at 31 December:

	2011 €'000	2010 €'000
Own funds		
Core Tier 1 capital	384.690	481.884
Original own funds	543.261	641.271
Supplementary own funds	196.081	207.460
Total original and supplementary own funds	739.342	848.731
Less: Participation in insurance companies and other regulatory adjustments	(43.133)	(42.186)
Total own funds	696.209	806.545
Risk weighted assets		
Credit risk	4.830.650	4.812.463
Market risk	40.113	51.875
Operational risk	529.900	514.275
	5.400.663	5.378.613
Core Tier 1 ratio	7,1%	9,0%
Tier 1 ratio	10,1%	11,9%
Tier 2 ratio	3,6%	3,9%
Capital adequacy ratio	12,9%	15,0%

The Group's policy is to maintain a strong capital base, in order to maintain investor, creditor and market confidence and support the future development of the Group's operations. The Central Bank of Cyprus requires the maintenance of a specific total capital ratio in relation to the risks undertaken by the Bank. The Group's Core Tier 1 ratio is marginally lower than the minimum 8% required ratio set by the Central Bank of Cyprus while Tier 1 and Capital Adequacy Ratio are above the minimum required limits of 9,5% and 11,5% respectively. The Group is already examining a Capital Strengthening Plan. In addition it takes all necessary actions to enhance the capital adequacy ratios, including the effective management of risk weighted assets and the strengthening of the capital base with profits, with main goal all ratios to exceed minimum required capital adequacy ratios.