

Article

Expected Credit Losses and Risk Disclosure in Financial Asset Reporting by Non-Financial Companies

Kiril Luchkov ^{1,*}, Nadya Velinova-Sokolova ² and Vanya Ivanova ¹¹ Department of Economics, Industrial Engineering and Management, Faculty of Management, Technical University of Sofia, 1000 Sofia, Bulgaria; v.ivanova@tu-sofia.bg² Department of Finance and Accounting, Faculty of Economics and Business Administration, Sofia University "St. Kliment Ohridski", 1113 Sofia, Bulgaria; nadya.sokolova@feb.uni-sofia.bg

* Correspondence: kiril.luchkov@tu-sofia.bg

Abstract

An integrated framework is developed for classifying and measuring financial assets, recognising expected credit losses (ECL), and disclosing financial risk in non-financial entities. Its design is based on the requirements of International Financial Reporting Standard 9 Financial Instruments (IFRS 9) and International Financial Reporting Standard 7 Financial Instruments: Disclosures (IFRS 7). The framework links contractual cash-flow characteristics, business models, measurement categories, impairment approaches, and risk disclosures in a single sequential procedure. Its applicability is examined using publicly available 2024 annual reports of ten large non-financial corporations from multiple sectors. A ten-indicator index is constructed to assess public traceability between accounting policies, loss allowances, trade-receivable information, forward-looking assumptions, and credit-risk disclosures. The application yields an average integration score of 94.00%, with stronger reporting for financial-asset categories, accounting policies, trade receivables, and the general or simplified ECL approach. More limited traceability is observed for the methods used to incorporate forward-looking information and for detailed provision-matrix disclosures. The framework is intended as a structured procedure for analysing public financial statements when internal credit-risk databases and model inputs are unavailable. Its contribution lies in integrating classification, subsequent measurement, impairment, and disclosure rather than treating them as separate compliance tasks. The proposed sequence can support accounting policy design, audit documentation, and comparative disclosure analysis. The index should be interpreted as a measure of reporting traceability rather than the economic accuracy of entities' internal credit-risk estimates.

Keywords: IFRS 9; IFRS 7; expected credit losses; ECL; risk disclosure; credit risk; non-financial entities



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1. Introduction

Expected credit loss (ECL) is an estimate of the shortfall between the contractual cash flows and the cash flows expected to be collected on a financial asset. Underestimating it can lead to an overstatement of the value of financial assets and an underrepresentation of credit risk. In non-financial corporations, this risk arises primarily from trade receivables, deposits, intra-group loans and debt instruments.

The implementation of IFRS 9 is a significant issue in modern financial reporting. The standard changes the classification, measurement and impairment of financial assets. The most significant conceptual change is the shift from an incurred loss model to an expected credit loss (ECL) model (López-Espinosa et al. 2021). Under this model, credit risk should be assessed not only on the basis of past events but also on reasonable and supportable forward-looking information about future economic conditions (Elashmawy and Kallunki 2026). Recent research identifies continuing challenges in the comparability of IFRS 9 outcomes and in the transparency of related disclosures (Cardoso Fontes et al. 2025). Subsequent developments in the regulatory framework enhance the topic's relevance. In May 2024, the International Accounting Standards Board issued amendments to IFRS 9 and IFRS 7 related to the classification and measurement of financial instruments, including the assessment of contractual cash flow characteristics and disclosures. This indicates that the classification, measurement and disclosure of financial instruments remains a dynamic area in which practical differences, professional judgments and the need for greater transparency continue to arise.

Therefore, the study of credit risk assessed through forward-looking information under IFRS 9 and IFRS 7 is relevant not only as an accounting issue but also as an issue of financial risk, decision usefulness and the quality of disclosures. In the literature, IFRS 9 is often analysed through the lens of the banking sector. This focus reflects banks' significant loan portfolios, internal default probability models and intensive regulatory environment (Awuye and Taylor 2025). Prior research has examined the interaction between the IFRS 9 expected credit loss model and supervisory rules, emphasising the importance of earlier recognition of credit losses for financial stability (Dong and Oberson 2022). Such an orientation is methodologically justified but does not exhaust the scope of the standard. Non-financial enterprises also recognise financial assets that fall within the scope of IFRS 9: cash, bank deposits, trade receivables, intra-group loans, debt instruments and equity investments. Banking evidence also indicates that expected-loss provisioning can affect liquidity creation (Ghosh 2024). Empirical evidence outside the banking sector has associated IFRS 9 adoption with changes in cash holdings, bad-debt provisions, and trade receivables.

This article points out the importance of this result, as it demonstrates that the logic of expected credit losses extends beyond bank loan portfolios. It can affect non-financial entities' operational financial assets and their liquidity management. Despite this importance, the application of IFRS 9 in non-financial entities often remains fragmented. The classification of financial assets is performed as a separate accounting procedure. The calculation of expected credit losses is considered a technical assessment. IFRS 7 disclosures are prepared as a subsequent explanatory section. Such an approach increases the risk of formal compliance with the requirements but with limited analytical usefulness for users of financial statements (ElKelish 2021). This problem is exacerbated when there is no clear relationship between the contractual cash flows, the business model, the measurement category, the credit risk parameters and the risk disclosures (Utami et al. 2025).

IFRS 9 suggests a different logic. The classification of financial assets is based on the business model for managing the assets and on the characteristics of the contractual cash flows. From this classification, the subsequent measurement, the applicable basis for recognition of gains and losses and the impairment treatment are derived. Expected credit losses should be measured in a manner that takes into account historical information, current conditions and forecasts. Forward-looking modelling of expected credit losses can be constructed by adjusting probability-of-default term structures using macroeconomic and macroprudential information (Breed et al. 2023). The disclosure layer is equally

important. IFRS 7 requires information about the significance of financial instruments and the nature and extent of the risks arising from them.

The regulatory analysis shows a need to improve the ECL disclosures under IFRS 7 and IFRS 9 in terms of relevance, comparability and transparency. Particular attention is paid to forecast information, the sensitivity of ECL estimates and the transparency of credit risk exposures. Greater transparency can discipline loss-provisioning choices and strengthen the analytical value of disclosure (Bischof et al. 2025). Based on the above, the main research thesis is that IFRS 9 and IFRS 7 should be modelled as an accounting-risk system for non-financial enterprises based on forward-looking information. Within this system, classification, measurement, impairment and disclosure are considered interdependent elements. If these elements are applied in isolation, a risk of inconsistency is created between the accounting category, the assessment of expected credit losses and financial risk disclosures. The aim of the article is to develop and implement an integrated framework for the classification, measurement, impairment and disclosure of financial assets under IFRS 9 and IFRS 7 for non-financial enterprises. The framework does not have an independent abbreviation and is presented as a sequence for classification, measurement, impairment and disclosure. It aims to establish a verifiable link between the assessment of whether contractual cash flows are solely payments of principal and interest (SPPI), the business model, and the measurement category. It also links these elements to the expected credit losses and the disclosures of credit, liquidity, and market risk.

The research question is formulated as follows: How can classification, valuation, expected credit losses and risk disclosure be integrated into a publicly traceable framework for non-financial enterprises?

The contribution of the study is outlined at four levels. At the conceptual level, an integrated framework is developed, through which the classification, measurement, impairment and disclosure of risk are considered as sequential rather than as separate procedures. At the methodological level, an index is developed to assess the public traceability between expected credit losses and credit risk disclosures. At the empirical level, the framework and index are applied to the public annual reports of non-financial companies, which allows for empirical application to reporting information. At the applied level, a protocol is proposed that can be used in the development of accounting policies, audit working files and comparative analysis of risk disclosures. The study's contribution does not consist in repeating regulatory requirements but in integrating them into a verifiable analytical structure. In this way, a bridge is created between professional judgment, the measurement of expected credit losses and the informational usefulness of disclosures (Zampella and Ferri 2024).

2. Theoretical Framework and Literature Review

2.1. IFRS 9, Expected Credit Losses and Classification

In the literature, IFRS 9 is seen as a significant milestone in the development of the accounting treatment of financial instruments, as it replaces the incurred loss model with an expected credit loss model (Pastiranová and Witzany 2021). This change shifts the focus from accounting recognition after a loss event has occurred to earlier recognition of credit risk through probability-weighted, current and forward-looking information. The forward-looking impairment model has consequently been evaluated in terms of timeliness, comparability and disclosure quality. The conceptual importance of this change is also evident in the relationship between the expected credit loss model, supervisory rules, and financial stability (Gómez-Ortega et al. 2022). Compared with the incurred loss model under International Accounting Standard 39 Financial Instruments: Recognition and Measurement (IAS 39), the IFRS 9 model leads to earlier and larger impairment adjustments.

It is also closer to the regulatory logic of expected losses (Boscia et al. 2022). This conclusion is important for the present study because it shows that the expected credit loss model is not just an accounting technique but a mechanism for reporting credit risk (Oberson 2021). This relationship is essential to avoid a mechanical application of the requirements without sufficient analytical value.

Forward-Looking Information and Modelling of Expected Credit Losses

The second main line of research in the literature is related to the way in which forward-looking information is incorporated into the calculation of expected credit losses (Hansen et al. 2024). Typically, the modelling of expected credit losses is considered in terms of three parameters: probability of default (PD), loss given default (LGD), and exposure at default (EAD). This structure allows historical observations to be supplemented with current and projected macroeconomic conditions, which is essential for the forward-looking nature of IFRS 9 (Malovaná and Tesařová 2022). A forward-looking methodology may adjust probability-of-default term structures using macroeconomic forecasts when expected credit losses are calculated under IFRS 9. The study is particularly relevant to this paper as it focuses on the relationship between expected credit losses, probability of default and macroeconomic information. However, its logic is mainly aimed at more advanced credit risk models, while the present paper aims to adapt this logic to non-financial corporations. Management judgment also plays an important role in the expected credit loss model. Managerial forecasting under IFRS 9 involves the interpretation of future conditions when expected credit losses are determined (Du et al. 2023). The study indicates that forecasting cannot be reduced to a mechanical calculation, as it involves the selection of scenarios, assumptions, forecasts and interpretation of past information (Engelmann and Nguyen 2023). This conclusion is also applicable to non-financial enterprises, although the toolkit for them is usually less complex. The practical estimation of expected credit losses may use credit-risk term structures and default parameters (Gubareva 2021). This study is significant for the methodological part because it confirms that the standard allows for different measurement techniques but requires them to be compatible with the principle of reasonable and supportable forward-looking information.

The classification of financial assets under IFRS 9 is a separate and significant area of research (Kvaal et al. 2024). It is not determined solely by the legal form of the instrument but by the business model for managing the financial assets and the contractual cash flow characteristics. The formal regulatory framework of IFRS 9 governs the classification and measurement of financial assets, financial liabilities and some contracts to buy or sell non-financial items. The classification analysis has a systemic function. When a financial asset is held to collect contractual cash flows and the contractual terms give rise only to payments of principal and interest, measurement at amortised cost may be justified. When the business model involves both collecting contractual cash flows and selling, the fair value through the other comprehensive income category may be applied. When these conditions are not met, fair value through profit or loss is applied. Thus, classification affects not only the balance sheet measurement but also subsequent impairment and disclosure (Pinto and Morais 2022). The relevance of the classification issue is confirmed by the amendments to IFRS 9 and IFRS 7 from May 2024. The International Accounting Standards Board states that the amendments are aimed at clarifying the classification of financial assets with environmental, social and governance (ESG) and similar characteristics, contractual cash flows and additional disclosures. This is important for this study, as it shows that contractual analysis, the SPPI assessment and disclosures continue to be an active area of international accounting regulation.

2.2. Non-Financial Entities and Disclosures Under IFRS 7

A significant portion of the literature on IFRS 9 and expected credit losses has focused on the banking sector (Idris et al. 2025). This is justified by the size of bank loan portfolios and the presence of sophisticated systems for assessing probability of default, loss given default and exposure at default. At the same time, this dominance leaves the application of IFRS 9 to non-financial entities less developed. In such entities, financial assets typically arise from operating activities, liquidity management, intra-group financing, and investment management of free cash resources. Empirical evidence indicates that IFRS 9 is also relevant to non-financial institutions and may affect cash holdings, bad-debt provisions, and trade receivables (Taiwah 2025). This result supports the choice of non-financial corporations as a research focus because it shows that the logic of expected credit losses can have management and liquidity effects outside the banking sector. In non-financial corporations, trade receivables are of particular importance. They often represent a significant financial asset for which the simplified approach and provision matrix are applied. Here, the main problem is not only computational. It requires segmentation of customers or receivables, selection of a historical period, assessment of delinquencies, inclusion of current conditions and adjustment for expected future changes. Therefore, trade receivables should be considered as a credit risk portfolio, and not only as an operational by-product of sales activity (Brito and Judice 2023).

The implementation of IFRS 9 outside the banking sector is not uniform. In non-financial companies, there are differences in practices and information availability (Taiwah 2025; Utami et al. 2025). In emerging market environments, different strategies have been established to comply with the requirements of IFRS 9 (Flores 2026).

The third important area in the literature and regulatory analysis is related to disclosures. IFRS 7 requires entities to provide information that enables users to evaluate the significance of financial instruments to financial position and performance, as well as the nature and extent of the risks arising from those instruments. Disclosure is thus positioned not as a technical addition to the accounts but as a means of understanding financial risk (Alsarayreh et al. 2022). IFRS 7 emphasises the interaction between qualitative and quantitative disclosures (Yamani et al. 2021). Qualitative information about risk management objectives, policies and processes should be linked to quantitative data on exposures, concentrations and sensitivities (Mnif and Znazen 2024a). This link allows a more complete picture of the nature and extent of the risks from financial instruments to be formed (Mnif and Znazen 2024b). Perceived transparency, trust and scepticism can influence stakeholder assessments of IFRS 9 implementation (Jassem et al. 2021). Regulatory analysis has identified a need to improve the consistency, comparability, and transparency of disclosures under IFRS 7 and IFRS 9 regarding expected credit losses. Special attention is paid to forward-looking information, significant increases in credit risk, movements in allowances, transparency of credit risk exposures and sensitivity of estimates of expected credit losses. If the calculations of expected credit losses are not linked to adequate disclosures, the reporting information remains incomplete (Mechelli and Cimini 2021). The loss allowance shows a numerical effect but does not sufficiently clearly disclose the assumptions used, the degree of risk, changes in credit quality and sensitivity to future conditions.

2.3. Scientific Gap and Contribution of the Study

The literature review highlights three main deficiencies. First, the literature on expected credit losses remains dominated by banking research, macroeconomic models and supervisory perspectives (Zang et al. 2026). This research is important but does not fully address the practical needs of non-financial corporations, where financial assets have different origins, structures and information availability. Second, classification, measurement,

impairment and disclosure are often treated as separate topics. As a result, the relationship between contractual cash flows, business model, measurement category, expected credit loss assumptions and disclosures is not always traced. Such separation limits the ability of IFRS 9 and IFRS 7 to be applied as a single risk accounting system. Third, disclosure under IFRS 7 is often treated as an outcome after the impairment calculation rather than as an integral outcome of the entire process. This creates a risk of incomplete transparency about the assumptions used, changes in credit risk, sensitivities, and risk concentrations. The literature review did not identify a sufficiently developed integrated model for non-financial entities. Such a model should link the classification of financial assets under IFRS 9, subsequent measurement, ECL and financial risk disclosure under IFRS 7. This article is positioned precisely in this gap. The proposed integrated framework is developed through which classification, measurement, impairment and disclosure are linked in a single application sequence. In this way, the aim is to overcome the fragmented application of IFRS 9 and IFRS 7 in non-financial entities and to propose a testable basis for accounting and risk modelling.

The regulatory framework for financial instruments is built through a functional distinction between presentation, classification, measurement, impairment and disclosure. International Accounting Standard 32 Financial Instruments: Presentation (IAS 32) is relevant for the distinction between a financial asset, a financial liability and an equity instrument (IFRS Foundation n.d.-a). IFRS 9 regulates the classification and measurement of financial assets, financial liabilities and certain contracts to buy or sell non-financial items (IFRS Foundation n.d.-c). IFRS 7 complements this framework by requiring disclosure of the significance of financial instruments for financial position and performance, as well as the nature and extent of the risks arising from them (IFRS Foundation n.d.-b). This regulatory structure has direct relevance to the integrated framework. A financial instrument should first be identified by its contractual substance. The applicable classification and measurement category under IFRS 9 is then determined. In a subsequent step, expected credit losses are measured when the financial asset falls within the scope of the impairment model. Finally, the results should be transformed into credit, liquidity and market risk disclosures under IFRS 7. For non-financial entities, this relationship is particularly important. Financial assets do not usually arise as the main product of a financing activity but as a result of sales, liquidity management, intra-group financing or investment of free cash resources. However, they fall under the same regulatory logic of classification, measurement, impairment and disclosure. For this reason, the application of IFRS 9 and IFRS 7 to non-financial entities should not be underestimated as a secondary accounting issue.

The classification of financial assets under IFRS 9 is based on two interrelated criteria: the business model for managing the financial assets and the characteristics of the contractual cash flows. A financial asset may be measured at amortised cost when the business model is designed to collect contractual cash flows. In addition, the contractual terms must give rise to cash flows that are solely payments of principal and interest on the principal amount outstanding. In a business model that includes both the collection of contractual cash flows and the sale of financial assets, fair value through other comprehensive income may be applied if the contractual cash flows meet the criteria of the SPPI assessment. When these conditions are not met, fair value through profit or loss is applied. The SPPI assessment is central. It assesses whether the contractual cash flows are consistent with the underlying credit agreement.

In such an arrangement, interest typically represents a consideration for the time value of money, credit risk, other fundamental risks and costs of lending, and a profit margin. If the contractual terms introduce exposure to risks or volatility that are not inherent in the

underlying credit arrangement, measurement at amortised cost or at fair value through other comprehensive income is not usually justified. The business model is not limited to the intention of a single instrument. It reflects the way in which groups of financial assets are managed to generate cash flows. Implementation evidence indicates that classification criteria require careful interpretation of contractual terms, governance arrangements and the way portfolios are managed (Madah Marzuki et al. 2021). This logic justifies the first module of the integrated framework, in which the contractual analysis and the business model are considered as the starting point of the entire accounting-risk sequence.

After classification, the subsequent measurement basis is determined (Löw and Erkelenz 2022). For amortised cost, the effective interest method is applied. For debt instruments measured at fair value through other comprehensive income, the asset is presented at fair value, but certain effects, including interest income and impairment, are recognised in profit or loss. For fair value through profit or loss, changes in fair value are recognised in current profit or loss. The classification decision therefore has consequences for the statement of financial position, profit or loss, other comprehensive income and impairment (Groff and Mörec 2021). This is one of the reasons why the model does not start directly with the calculation of expected credit losses. Before that, it must be established what the nature of the financial asset is and what measurement basis is applicable. Only in this way can consistency between classification, measurement and impairment be ensured. This consistency is also essential for disclosures. Users of financial statements should be able to trace why a financial asset is classified in a particular category and how that category affects subsequent measurements. They should also be able to trace its effects on profit or loss, other comprehensive income, and credit risk adjustments. Therefore, the measurement basis should not be viewed as a technical outcome but as a link between contractual analysis and reporting presentation.

The IFRS 9 impairment model is based on expected credit losses. It replaces the approach in which losses are recognised after a loss event has occurred with a model in which credit risk is recognised earlier and through forward-looking information. The official materials of the IFRS Foundation emphasise that the IFRS 9 impairment model is based on forward-looking information and is designed to ensure more timely recognition of credit losses. The general approach includes three stages. In the first stage, 12-month expected credit losses are recognised. If a significant increase in credit risk (SICR) has occurred since initial recognition, lifetime expected credit losses are recognised. For credit-impaired financial assets, expected credit losses are recognised for the life of the financial instrument, but interest income is calculated on the amortised cost rather than on the gross carrying amount. For non-financial entities, this logic applies to several common asset classes. Cash, deposits, intra-group loans and debt instruments may be subject to the general approach when they are not measured at fair value through profit or loss. For trade receivables, contract assets and certain lease receivables, a simplified approach is applied, in which lifetime expected credit losses are recognised without tracking significant increases in credit risk through the three-stage structure.

The simplified approach is particularly relevant for non-financial entities, as trade receivables are often one of the most significant financial assets. It assesses expected credit losses over the life of the receivables (Engelmann 2021). In practice, this allows for the use of a provision matrix based on ageing structure, historical collection, grouping of exposures by similar credit risk characteristics and adjustments for current and expected economic conditions. This approach should not be reduced to a mechanical application of historical loss rates. IFRS 9 requires that expected credit losses be assessed using information about past events, current conditions and forecasts of future economic conditions, when such information is reasonable and supportable and is available without undue cost or effort.

Therefore, the provision matrix is considered in the model as a forecasting tool. It should relate historical collection to the current credit environment and to expected future changes. This is particularly important for entities with different customer segments, geographical markets or industry risks. If all trade receivables are treated with a single overall loss rate, the relationship between the credit risk profile of the specific group of receivables and the amount of allowance recognised may be disrupted. Therefore, the provision matrix should be developed as an analytical tool, not an administrative table.

IFRS 7 requires entities to provide information that enables users of financial statements to evaluate the significance of financial instruments to financial position and performance, and the nature and extent of the risks arising from those instruments. Both qualitative and quantitative disclosures are required about risks, including credit, liquidity and market risk. Qualitative disclosures should disclose risk exposures, how those risks arise, the objectives, policies and processes for managing risk, and the measurement methods used. Quantitative disclosures should provide information about the extent of risk exposure, concentrations, maturities, sensitivities and other indicators that are relevant to users of financial statements. Disclosure plays a particular role in the case of expected credit losses. It is not sufficient to simply state the amount of the loss allowance. The methods used, assumptions, changes in credit risk, forward-looking information, movement of the allowance, concentrations and sensitivity of estimates should be explained. Therefore, in the integrated framework, disclosure is placed as a separate module rather than as a subsequent technical application.

Amendments to IFRS 9 and IFRS 7, issued in May 2024, confirm the relevance of the classification, measurement and disclosure of financial instruments. They address issues related to financial liabilities settled through electronic payment systems, the assessment of the contractual features of the cash flows of financial assets and additional disclosures. Of particular importance is the part related to the contractual features of the cash flows. For financial assets with contingent features, including ESG-related parameters, the question may arise whether the contractual cash flows remain consistent with the underlying credit agreement (Brouwer and ter Hoeven 2024). This reinforces the importance of the SPPI assessment and shows that the classification element of the framework should be sufficiently sensitive to contractual clauses that change the amount or timing of the cash flows. These amendments also support the inclusion of a disclosure module. As the contractual characteristics of financial instruments become more complex, users of financial statements need clearer information about risk, measurement categories and possible effects on future cash flows.

The main conceptual logic of the article is derived from the reviewed regulatory framework. A financial asset should be analysed sequentially: first, through its contractual characteristics; second, through the business model; third, through the applicable measurement category; fourth, through the expected credit loss model; and fifth, through the financial risk disclosures. This sequence provides the conceptual basis of the integrated framework. Its function is not to replace the requirements of the standards but to ensure their systematic application in non-financial entities. In this way, a verifiable link is created between the regulatory classification, accounting measurement, credit risk measurement and reporting transparency. This limits the risk that individual requirements are technically fulfilled without creating a sufficient link between measurement and disclosure. In non-financial entities, such a sequence is particularly important because risk is often dispersed between trade receivables, cash and intra-group receivables.

3. Proposed Integrated Framework

The integrated framework is developed to systematically apply the requirements for classification, measurement, impairment and disclosure of financial assets to non-financial

entities. Its purpose is to overcome the fragmented treatment of financial assets, where the classification analysis, subsequent measurement, calculation of expected credit losses and risk disclosure are carried out as separate procedures. The framework is based on the understanding that the classification of a financial asset is not a stand-alone technical act. It determines the subsequent measurement basis, influences the recognition of financial income, losses and other comprehensive income, predetermines the applicable impairment regime and creates the basis for financial risk disclosure. Therefore, the framework is organised as a sequence, where each analytical result is used as an input for the next stage. The basic logic of the framework can be presented as follows: contractual analysis → business model → measurement category → expected credit losses → risk disclosure. This sequence is particularly relevant for non-financial entities, as financial assets often arise from operating activities, liquidity management, intra-group financing or investment of free cash resources. Despite their lower structural complexity compared to bank loan portfolios, these assets can give rise to significant credit risk and require reliable measurement and disclosure.

The framework consists of four interrelated modules: classification, measurement, impairment and disclosure. Each module has a separate analytical function. Classification determines the applicable category of the financial asset. Measurement converts this category into an accounting basis for subsequent presentation. Impairment introduces expected credit losses and an allowance for them. Disclosure converts the accounting result into information for users of financial statements. The framework is structured so that none of these stages is applied in isolation. In this way, a consistent relationship is created between contractual analysis, professional judgment and public reporting information.

The figure is included as a flowchart that guides the reader from the contractual analysis to the SPPI assessment, business model, measurement category, expected credit loss approach and risk disclosure. It should be read in conjunction with Table 1, where the same logic is broken down into modules and specific analytical actions.

Table 1. Structure of the integrated framework.

Module	Main Analytical Question	Main Result
Classification	What is the nature of the financial asset according to the contractual cash flows and business model?	IFRS 9 category
Measurement	What subsequent measurement basis should be applied?	Amortised cost, fair value through other comprehensive income or fair value through profit or loss
Impairment	How should expected credit losses be measured?	12-month expected credit losses, lifetime expected credit losses or provision matrix
Disclosure	How are the results converted into financial risk information?	Qualitative and quantitative disclosures under IFRS 7

Source: Authors' compilation.

The presented structure shows that the four modules do not function as parallel procedures. The classification result serves as input for measurement, the measurement basis determines the scope of impairment, and the impairment must be linked to the disclosures under IFRS 7. Thus, the table acts as a bridge between the flowchart and the subsequent methodological steps.

The first module begins by identifying the financial asset and determining whether it falls within the scope of IFRS 9. Two sequential assessments are then applied: a contractual cash flow analysis and a business model analysis. The contractual analysis establishes whether the cash flows represent solely payments of principal and interest on the outstanding principal. The business model analysis assesses whether the asset is held to collect contractual cash

flows, to collect and sell, or is managed on another basis. When the SPPI criterion is met and the business model is focused on collecting contractual cash flows, the asset is classified at amortised cost. When the SPPI criterion is met but the business model includes both collecting contractual cash flows and selling the asset, the fair value through the other comprehensive income category is applied. When these conditions are not met, the financial asset is classified at fair value through profit or loss. Within the proposed framework, the classification performs not only a regulatory but also a risk-analytical function. It determines whether the financial asset will be subject to the expected credit loss model, how it will be measured, how the financial effects will be recognised and what disclosure blocks will be required. Particular attention is paid to contractual clauses that may change the amount or timing of cash flows. Such clauses may include prepayment clauses, interest rate caps, indexations, contingent payments, sustainability indicators or other mechanisms that may affect the SPPI assessment. The overall sequence for the classification, measurement, impairment, and disclosure of financial assets is presented in Figure 1.

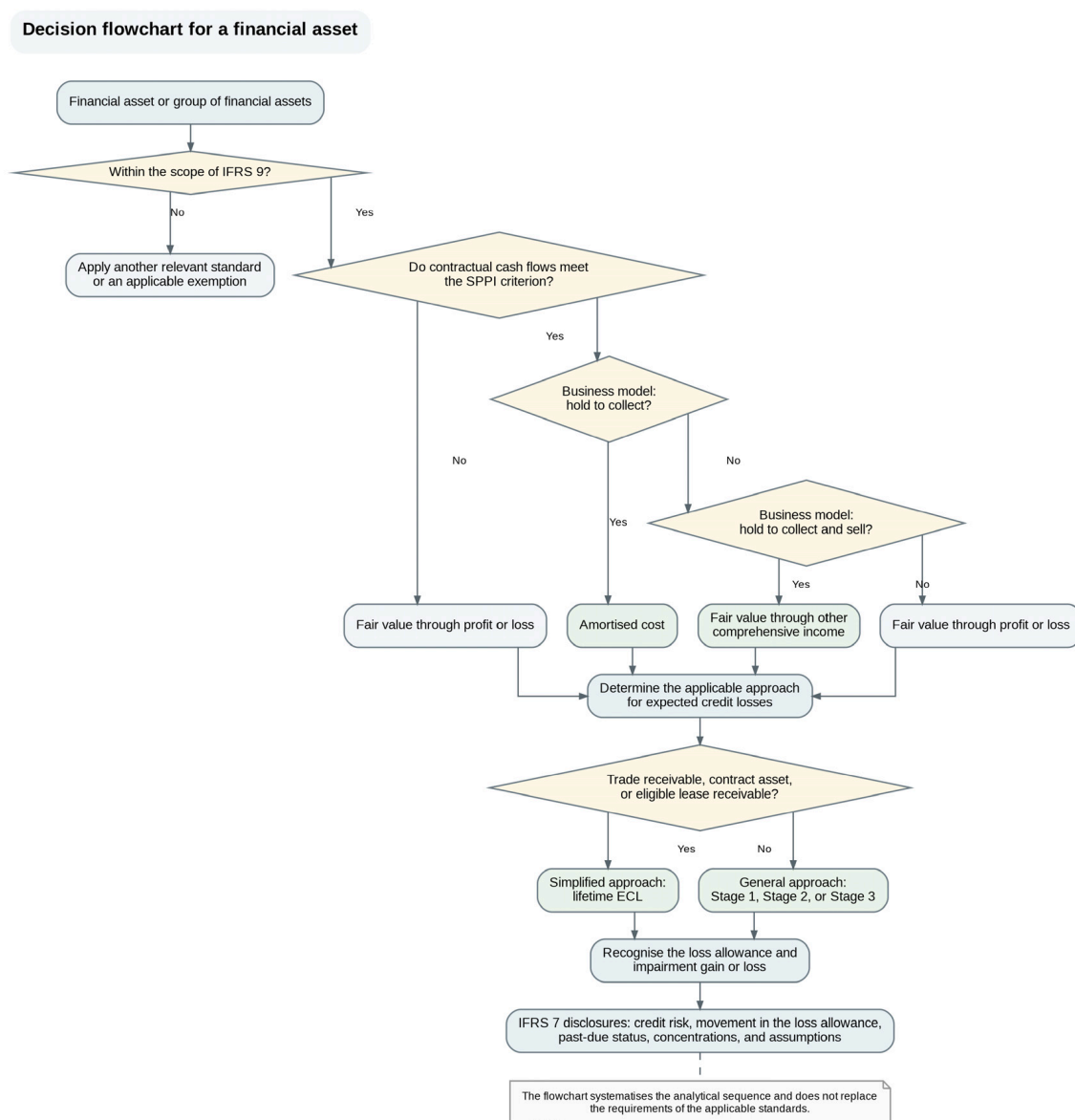


Figure 1. Sequence for classification, measurement, impairment and disclosure of financial assets. Source: Authors' compilation.

The second module translates the classification decision into a subsequent measurement basis. For financial assets classified at amortised cost, the effective interest method is used. For debt instruments classified at fair value through other comprehensive income, fair value measurement and recognition of certain effects in profit or loss are combined. For financial assets at fair value through profit or loss, changes in fair value are recognised in the current profit or loss. The measurement module has an intermediate function between classification and impairment. It shows that a financial asset cannot be subjected to an expected credit loss analysis without determining how it is measured after initial recognition. For example, a debt instrument at amortised cost and a debt instrument at fair value through other comprehensive income may both fall within the scope of the expected credit loss model. However, they present their balance sheet and reporting effects differently.

The third module focuses on measuring expected credit losses. It applies a forecasting logic, where credit losses are estimated using historical information, current conditions and reasonable expectations of future economic conditions. The IFRS 9 impairment model focuses on recognising expected credit losses, not just losses that have already occurred, which is why the expected credit loss module is central to the entire framework. The model distinguishes between two main regimes. The first is the general approach, applicable to financial assets such as cash held with banks, term deposits, intra-group loans and debt instruments when they are not measured at fair value through profit or loss. It assesses whether credit risk has increased significantly since initial recognition. The second regime is the simplified approach, applicable mainly to trade receivables, contract assets and certain lease receivables. It does not track significant increases in credit risk through a three-stage structure but recognises lifetime expected credit losses. This approach is particularly important for non-financial entities, as trade receivables often represent a significant financial asset related to the operating activity and credit policy towards customers. The simplified approach may be operationalised through a provision matrix or another method consistent with the measurement principles of IFRS 9. Receivables are grouped according to similar credit risk characteristics, for example, ageing structure, customer segment, geographic market, industry or type of contract. Historical loss rates are adjusted for current conditions and expected future changes.

For methodological illustration, the calculation of expected credit losses under a simplified parametric implementation of the general approach is represented by the following relationship, in which the discount factor (DF) captures the time value of money:

$$ECL_t = EAD_t \cdot PD_t \cdot LGD_t \cdot DF_t$$

In this relationship, ECL denotes expected credit losses; EAD is the exposure at default; PD is the probability of default; LGD is the loss given default; and DF is the discount factor when the effect of the time value of money is material. The formula serves to follow the logic of the calculations and does not override the principle-based nature of IFRS 9. It represents a single-scenario parametric approximation and does not exhaust the probability-weighted cash-shortfall measurement required by IFRS 9.

Under the simplified approach for trade receivables, the gross carrying amount (GCA) and expected credit loss rate (LR) for a specific age group are related as follows:

$$ECL_{j,t} = GCA_{j,t} \cdot LR_{j,t}$$

The total amount of expected credit losses under the provision matrix is determined as the sum of expected credit losses in all age groups:

$$ECL_{total,t} = \sum_{j=1}^m (GCA_{j,t} \cdot LR_{j,t})$$

In these formulas, GCA is the gross carrying amount of receivables in the respective age group, LR is the expected credit loss rate, j denotes the age group, t denotes the reporting date, and m is the number of age groups used. The expected credit loss rate is derived from historical experience, current conditions, and projected economic changes, where such information is reasonable and supportable. For trade receivables and contract assets without a significant financing component, LR represents a lifetime expected loss rate; the use of a provision matrix remains a practical expedient rather than a mandatory method.

The methodological toolkit and the corresponding evidentiary trail are summarised in Table 2.

Table 2. Methodological toolkit for deriving the results.

Element	Formula/Rule	Application and Evidentiary Trail
General approach to ECL	$ECL_t = EAD_t \cdot PD_t \cdot LGD_t \cdot DF_t$	It may be used for loans, deposits, debt instruments and other assets within the scope of the general approach as a simplified parametric approximation. It is tracked by gross carrying amount, credit quality, credit risk stage, collateral, scenario assumptions and other relevant inputs.
Simplified approach for trade receivables	$ECL_{total,t} = \sum_{j=1}^m (GCA_{j,t} \cdot LR_{j,t})$	It may be used for trade receivables and contract assets without a significant financing component. GCA is the gross carrying amount of the group, and LR is the lifetime expected credit loss rate. The evidence trail is based on ageing analysis, historical losses, current conditions and forward-looking adjustments.
Discount factor	$DF_t = (1 + r)^{-t}$	It is used when the effect of the time value of money is significant. r is the effective interest rate determined at initial recognition, or an approximation thereof, as applicable under IFRS 9, and t is the period to the expected cash flow.
Change in loss allowance (LA)	$\Delta LA_t = LA_t - LA_{t-1}$	The formula measures the net change in the loss allowance balance. It should not be interpreted as the impairment expense unless additions, reversals, write-offs, foreign-exchange effects, transfers and other movements have been reconciled.
Integration index	$I = \frac{\sum_{i=1}^n S_i}{S_{max}} \cdot 100; S_{max} = 2 \cdot n$	n indicators are used with scores of 0, 1 or 2. The index measures the public traceability between ECL and risk disclosure, not the actual level of credit risk.
Subindex by module	$I_m = \frac{\sum_{i=1}^m S_{i,m}}{2 \cdot n_m} \cdot 100$	It is used to separately assess classification, impairment, trade receivables and risk disclosure. This shows where the strength or weakness of disclosures is concentrated.
Indicator-exclusion check	$I^{(-K)} = \left(\frac{\sum_{i \notin K} S_i}{2 \cdot (n - K)} \right) \cdot 100$	It shows how the average index value changes when a selected indicator or group of indicators is excluded. In the formula, K denotes the excluded indicators, $ K $ is their number, and S_i are the scores of the remaining indicators. The result is descriptive and does not independently validate reliability.

Source: Authors' compilation. Abbreviations: DF, discount factor; EAD, exposure at default; ECL, expected credit losses; GCA, gross carrying amount; LA, loss allowance; LGD, loss given default; LR, expected credit loss rate; PD, probability of default.

The table identifies the relationship between the formulas used, the publicly observable inputs and the way in which the results are derived. This ensures traceability between the annual financial statement, the recognised loss allowance, the index assessment and the subsequent interpretation. The ECL and discounting equations are used as methodological

representations, whereas the empirical results are derived from the integration index, its module sub-indices and the indicator-exclusion variants. The hypothetical numerical applications reported in Appendix B demonstrate the operation of the ECL, provision-matrix, loss-allowance, and index formulas.

The fourth module transforms the results of the classification, measurement and impairment into qualitative and quantitative disclosures under IFRS 7. The main objective is to provide information that allows users of the financial statements to assess the significance of financial instruments and the nature and extent of the risks arising from them. In the model, disclosure is not treated as a subsequent technical application. It is considered an analytical output from the previous modules. For each class of financial assets, the accounting policy, category, measurement basis, credit risk exposure and impairment approach should be disclosed. The assumptions used, the movement of the allowance, delinquencies, concentrations and, where relevant, sensitivity to key parameters should also be disclosed. This module is particularly relevant for expected credit losses. The amount of the loss allowance alone is not sufficient if it is not accompanied by information on the models used, inputs, assumptions and changes in credit risk. Therefore, the disclosure module provides a link between numerical assessment and reporting transparency.

The framework algorithm is presented as a sequence of nine steps that can be applied to an individual financial asset or to a group of financial assets with similar credit risk characteristics. The sequence and the corresponding analytical actions and outcomes are summarised in Table 3.

Table 3. Sequence for applying the framework.

Step	Analytical Action	Result
1	Identification of the financial asset	Scoping
2	Contractual cash flow analysis	Conclusion on the SPPI assessment
3	Business model analysis	Management objective
4	Determining the category under IFRS 9	Amortised cost, fair value through other comprehensive income or fair value through profit or loss
5	Determining the subsequent measurement basis	Measurement method
6	Determining the applicable approach for expected credit losses	General or simplified approach
7	Calculation of expected credit losses	Loss allowance
8	Risk exposure analysis	Credit, liquidity and market risk
9	Preparation of disclosures	Qualitative and quantitative data under IFRS 7

Source: Authors' compilation.

This sequence allows the causal relationship between the contractual analysis, the management objective, the measurement basis, the credit risk measurement and the disclosure to be traced. The framework can serve as a basis for accounting policy, internal control, audit documentation and preparation of explanatory notes to the financial statements. Its applicability is determined by the possibility of linking each conclusion to a specific input element. If a given step cannot be documented, the result should be interpreted conservatively. This rule is important when applied to public reports, because the reports do not always contain the full internal parameters of the models. Therefore, the framework uses only information that is publicly traceable. This avoids the claim of recalculating internal estimates to which there is no access.

To ensure a link between the computational and disclosure layers, a matrix is introduced to transform the results of the framework into disclosures. The matrix serves as a

control tool. It checks whether each outcome of the framework leads to a specific disclosure function. It is particularly important in public reports because it allows an assessment of whether the loss allowance is accompanied by sufficient information on the method, assumptions and credit risk exposure. If a given outcome cannot be linked to a specific disclosure, this indicates a potential weakness in reporting transparency. Thus, the matrix does not add a new regulatory requirement but structures the verification of already existing disclosure elements. Its function is analytical and documentary.

The relationship between framework outcomes and disclosure functions is summarised in Table 4.

Table 4. Matrix for linking outcomes of the framework to disclosures.

Framework Result	Disclosure Function
IFRS 9 category	Disclosure of classes of financial instruments and measurement bases
Business model	Explanation of the management objective and the method of generating cash flows
Conclusion on the SPPI assessment	Justification of the applicable measurement category
Exposure at default, probability of default and loss given default or provision matrix	Disclosure of methods and assumptions for measuring credit risk
Loss allowance	Disclosure of movements in the loss allowance
Past-due status and credit quality	Disclosure of credit risk exposure
Concentrations	Disclosure of concentration by counterparty, sector or geography
Key ECL inputs and assumptions	Disclosure of significant inputs, assumptions, estimation techniques and changes therein

Source: Authors' compilation.

The matrix shows whether each significant accounting or risk analysis result has been translated into information that is useful to users of the financial statements. Disclosure is not considered a formal add-on to the calculations but rather the final step in the same methodological sequence. This is particularly important for non-financial entities, where credit risk is often associated with trade receivables, cash and intra-group exposures.

The framework is designed to be able to account for emerging contractual features of financial assets. This is important in view of the amendments to IFRS 9 and IFRS 7 from 2024, which affect the classification and measurement of financial instruments, as well as the related disclosures. A separate test for conditional features of contractual cash flows is provided in the classification module. Where payments are contingent on sustainability indicators, market indices or other contingent parameters, it should be analysed whether these features remain consistent with the underlying credit arrangement. If such consistency cannot be justified, the asset should be classified at fair value through profit or loss unless another applicable accounting treatment is applicable. It allows the framework to be used not only for traditional financial assets but also for instruments with more complex contractual features. At the same time, adaptability does not mean introducing a new accounting category but more clearly documenting the professional judgment in the analysis of contractual cash flows.

The scientific novelty of the integrated framework lies in the integration of four analyses that are often considered separately: classification, measurement, impairment and disclosure. In existing practice, the classification analysis often ends with the determination of an IFRS 9 category, the calculations of expected credit losses are performed as a separate accounting estimate, and the disclosures are prepared as an explanatory part. The proposed

framework overcomes this separation through a sequential algorithm, in which each result is used as an input for the next module. The contribution of the framework can be summarised in three directions. First, it provides a methodological link between the SPPI assessment, the business model and the measurement category. Second, impairment is placed in a forecast credit risk framework based on 12-month or lifetime expected credit losses, as well as a provision matrix for trade receivables. Third, the results of the framework are translated into disclosures that can improve the consistency between accounting estimates and risk information.

The integrated framework is an applied sequence through which the financial assets of non-financial entities are analysed from their contractual characteristics to the disclosure of financial risk. It does not replace professional judgment but organises and documents it. This creates a basis for regulatory compatibility, internal consistency, audit trail and disclosure utility. Illustrative applications of the framework and their relationship to its individual modules are provided in Appendix B (Table A3).

4. Methodology

4.1. Methodological Approach, Data Sources and Analysed Enterprises

The study applies a methodological approach aimed at developing an applicable sequence for the classification, measurement, impairment and disclosure of financial assets in non-financial enterprises. The approach was chosen because the problem under consideration is not reduced to the interpretation of a separate provision but requires linking several requirements into a verifiable accounting-risk sequence. The use of public annual financial statements allows the relationship between the accounting assessment and the disclosed risk information to be monitored from the perspective of public traceability. It does not provide access to the enterprise's internal credit risk system. It is this traceability that is used as the basis for deriving the results.

The methodological process is presented in six consecutive steps. First, the problem related to the fragmented application of IFRS 9 and IFRS 7 is defined. Second, the purpose of the applied sequence is formulated. Third, the input data that can be found in public financial statements are defined. Fourth, the index formulas are applied to the empirical scores, while the ECL formulas are specified and illustrated numerically. Fifth, for each assessment, an evidentiary trail from the relevant annual report is indicated. Sixth, the limitations, the stability of the average under selected indicator exclusions and the applicability of the proposed sequence are deduced. The entity-level evidence map and the complete indicator-level score matrix used in the assessment are presented in Appendix A.

The object of the study is the financial assets of non-financial entities that fall within the scope of IFRS 9 and require classification, subsequent measurement, impairment and disclosure. The subject of the study is the relationship between the contractual characteristics of financial assets, the business model for their management, the measurement category, the measurement of expected credit losses and the disclosure of financial risk. The main analytical unit is the individual financial asset or a group of financial assets with similar credit risk characteristics. In the general approach, this can be an individual instrument, for example, a deposit, an intra-group loan or a debt instrument. In the simplified approach, this can be a portfolio of trade receivables grouped by ageing structure, customer segment, geographical area or sector risk. In this way, a clear distinction is ensured between the input data, the analytical activities performed and the results obtained. This distinction is important for verifiability because it allows each conclusion to be linked to specific reporting information.

The study uses four complementary methods. First, a normative-conceptual analysis is applied. It systematises the requirements of IFRS 9 on classification, measurement and

impairment, as well as the requirements of IFRS 7 on financial risk disclosure. This analysis is necessary because the framework must be compatible with the standards and not create alternative reporting logic. Second, an applied methodological development is used. The regulatory requirements are organised into the modules defined in Section 3. Each module has input data, analytical action and output result. This ensures traceability between the contractual analysis, the business model, the measurement category, the expected credit losses and the risk disclosure. Third, an analysis of real public annual financial statements of non-financial enterprises is used. It verifies whether the proposed sequence can be applied to actual accounting policies, notes on financial instruments, movements in the loss allowance and credit risk disclosures. Fourth, a matrix mapping between the results of the framework and the disclosure requirements of IFRS 7 is used. This verifies whether the accounting result is translated into information that is useful to users of the financial statements.

The input data are grouped into four main categories. The first category includes the contractual characteristics of the financial asset: principal, interest rate mechanism, maturity, currency, prepayment clauses, contingent payments, interest rate caps, indexations and other conditions that affect the SPPI assessment. The second category includes information about the business model: purpose of holding the financial asset, frequency and significance of sales, internal reporting to management, performance indicators and the link to risk management. The third category includes credit risk parameters: exposure at default, probability of default, loss given default, collateral, credit rating, delinquency, historical losses and forward-looking adjustments. The fourth category includes disclosure parameters: classes of financial instruments, risk concentrations, maturities, movement of loss allowance, key ECL inputs, assumptions and estimation techniques and qualitative information on risk management. This structure allows each input to be linked to a specific analytical step and to subsequent disclosure. This reduces the risk of an unclear relationship between the data used, professional judgment and the final result of the framework.

The forward-looking adjustment is applied at the portfolio level. First, the risk characteristics and time horizon are determined. Observable factors related to collectability are then selected. Their expected impact on credit losses is assessed. The historical loss rate is adjusted and applied to the relevant segment. The factor used, the basis for the selection and the effect on ECL are documented. In the case of material uncertainty, reasonable alternative assumptions are considered.

4.2. Analysis Sequence and Evaluation Procedure

The empirical application is carried out through publicly available annual financial statements of large non-financial enterprises that apply IFRS. The sample is purposive and includes ten companies. The study does not aim at statistical generalisation to the entire population but rather at an applied verification of the framework on public disclosures. The selection was carried out according to predefined criteria: non-financial sector, presence of a consolidated annual report, application of IFRS, publicly available notes on financial instruments and presence of disclosures on trade receivables or credit risk. Additionally, sectoral diversity was sought so that the framework was not tested on only a single industry. Companies from the chemical industry, food and beverage, consumer goods, aviation industry, industrial technologies, pharmaceuticals, health technologies and beverages are included. This selection allows assessment of whether the index remains applicable to different structures of financial assets, different levels of trade receivables and different degrees of detail of disclosures. The results are interpreted as an analytical application and are not used for statistical generalisation.

The framework is assessed using four criteria: regulatory compatibility, internal consistency, applicability and disclosure utility. Regulatory compatibility means that each step of the framework should be traceable to the requirements of IFRS 9 or IFRS 7. Internal consistency means that the results of one module should logically lead to the next module. Applicability means that the model should be applicable to typical financial assets of non-financial entities without the need for a bank-level risk infrastructure. Disclosure utility means that the results should be able to be translated into qualitative and quantitative disclosures. These criteria test whether the framework is compatible with regulatory requirements, practically usable, and sufficiently transparent for external review. The assessment does not aim to prove universal applicability. It checks whether the proposed structure can be applied to real public reports.

To support consistent application of the framework, its use is organised as a sequential protocol of actions that can be applied by another researcher on the same or a different set of financial statements. First, it is determined whether the entity is non-financial and whether its financial statements are prepared in accordance with IFRS. Then, the notes to the financial statements that relate to financial instruments, trade receivables, impairment, credit risk, liquidity risk and market risk are identified. Each relevant note is linked to a specific indicator of the expected credit loss and risk disclosure integration index. The assessment is performed on a predefined three-point scale, and for each score assigned, a justification from a specific note, table, movement in the loss allowance or accounting policy description must be recorded. When an element is described only in general terms but lacks quantitative or methodological traceability, an intermediate score is assigned. Where a specific policy, quantitative allowance, movement, segmentation or a clear description of the ECL inputs and assumptions used is disclosed, a full score is awarded. This limits, but does not eliminate, judgment in scoring and provides a verifiable link between the public report, the index and the research conclusion.

The protocol is designed to make the methodology transparent and applicable without access to the internal management systems of the entities. It does not require recalculation of all expected credit losses where the public reports do not contain the full input parameters for probability of default, loss given default and exposure at default. Qualitative evidence on IFRS 9 compliance strategies supports examining whether disclosed classification policies, impairment practices, loss allowances and risk disclosures are internally connected (Flores 2026). Where only a general accounting policy is disclosed but no quantitative or methodological evidence is provided, a lower score is assigned to the relevant indicator. This applies, for example, to the absence of movement in the allowance, the age structure of receivables or a description of the assumptions used. If specific tables, quantitative data, segmentation, credit risk groups and an explanation of the assumptions used are presented, the score is increased. Equal weights of indicators are used because the aim is not to measure the economic significance of each disclosure but to establish whether each key element of the framework is publicly traceable. In the case of ambiguous disclosure, a conservative assessment is applied, whereby a higher score is awarded only if there is a clear link between the accounting assessment and the risk disclosure. No empirical basis was established for assigning different weights to individual indicators.

The practical sequence for working with public reports is systematised in Table 5. It shows how to move from selecting an entity to an evidence trail, scoring by indicators and checking the calculations.

Table 5. Protocol for implementing and documenting the framework.

Step	Action	Document
1	Determining the status of the enterprise as non-financial	Sector and reason for inclusion in the sample
2	Verification of the reporting base	Confirmation that the report has been prepared in accordance with IFRS
3	Identifying relevant notes	Notes on financial instruments, receivables, impairment and risk
4	Scoring by indicators	Score 0, 1, or 2 according to predefined rules
5	Calculating index and sub-indices	Sum, percentage and grouping across the four modules
6	Indicator-exclusion check	Recalculation after excluding selected indicators
7	Recording the evidence trail	Brief rationale and reference to reporting element

Note: Table 5 has a control function. It limits the risk of arbitrary assignment of scores because each decision is linked to a specific reporting document, note, table or accounting policy. Thus, the methodology can also be applied to other non-financial entities where sufficiently detailed public disclosures are available. Source: Authors' compilation.

The index is considered a measure of the public consistency between expected credit losses and risk disclosure rather than a measure of the actual level of credit risk. The content relevance of the index is supported by a direct link between the ten indicators and the four modules of the framework: classification, measurement, impairment and disclosure. Each indicator is included because it reflects a reporting element without which the relationship between financial assets, loss allowance and credit risk information cannot be publicly traced. In order to limit subjectivity, rules for assigning scores of 0, 1 and 2 are defined before the assessment. In the case of ambiguous disclosures, a conservative rule is applied, according to which a higher score is assigned only if there is a clearly observable quantitative or methodological trace. The assessment was repeated through a separate internal review of the financial statements, and discrepancies were resolved by reference to the predefined criteria.

To check reliability, a second independent rater re-rated 30 observations for three enterprises. The same predefined criteria were used. The initial ratings were not provided to the second rater. Inter-rater reliability was measured using Cohen's kappa. The subsample was selected to include enterprises with different levels of the initial index.

4.3. Formulas, Evidence Trail and Checks by Excluding Indicators

The index has clear interpretative limits that should be considered when using the results. It does not check the mathematical correctness of the companies' internal models and does not validate the probability of default, loss given default or exposure at default. The index only measures whether the public report provides sufficient information to trace the relationship between expected credit losses and risk disclosure. Therefore, a company with a high score on the index should not automatically be considered as having lower credit risk. A high score means that disclosures are better integrated, more clearly documented and more easily traceable from the perspective of an external user. Alternative calculations were used to show how the average score changes when indicators related to forward-looking information and key ECL inputs and assumptions are excluded. These calculations do not constitute statistical validation or independent evidence of reliability.

A nonparametric bootstrap at the enterprise level was applied to assess the robustness of the mean, and 10,000 replications with replacement were used. The 95% per-

centile bootstrap interval was determined using the 2.5th and 97.5th percentiles of the bootstrap distribution.

5. Results

5.1. Scope of Empirical Application

The empirical application tests whether the proposed framework can be applied to publicly available annual financial statements of non-financial enterprises. The analysis is based on actual accounting policies, disclosed loss allowances, trade receivables data, credit risk parameters and risk management descriptions. The sample comprises ten large public corporations, which are selected purposively rather than through a probability sampling procedure. Purposive selection was chosen because it is necessary for corporations to have sufficiently rich public records to allow for tracking of individual indicators. The inclusion of different sectors allows for the assessment of the applicability of the framework to different business models and different types of financial assets. The sample does not include banks, insurers and specialised financial institutions in order to maintain the focus on non-financial corporations. Therefore, the results are interpreted as an empirical application test and not as a statistically representative measurement of the practices of all non-financial corporations.

Table 6 presents the companies used for the empirical application. Each company is analysed through its publicly available annual financial statements, looking for disclosures on financial assets, trade receivables, expected credit losses, loss allowance, credit quality, collateral, concentrations, key assumptions and any reported sensitivities. The selected companies are large international groups, and therefore their reports contain more detailed information than typical small or medium-sized companies. This feature is a methodological advantage because it allows the framework to be applied to detailed public disclosures. At the same time, it is a limitation, because the results should not be mechanically transferred to companies with a more limited reporting infrastructure. The use of ten enterprises reduces the dependence of the results on the practice of a single enterprise without ensuring statistical representativeness.

Table 6. Empirical application sample.

Enterprise	Sector	Report Document	Reporting Date	Main Testing Object
BASF SE	Chemical industry	BASF Report 2024	31 December 2024	Trade receivables, internal and external credit risk assessments, simplified approach
NESTLÉ S.A.	Food and beverages	Financial Statements 2024	31 December 2024	Trade receivables, allowance for losses, low credit risk, concentrations
ADIDAS AG	Consumer goods	Annual Report 2024	31 December 2024	Simplified approach, portfolio grouping, probability of default, loss given default and exposure at default
AIRBUS SE	Aviation and defence industry	Financial Statements 2024	31 December 2024	Trade receivables, contract assets, impairment stages, low credit risk

Table 6. *Cont.*

Enterprise	Sector	Report Document	Reporting Date	Main Testing Object
SIEMENS AG	Industrial technologies	Annual Financial Report 2024	30 September 2024	Credit-rating groups, trade receivables, collateral, movement of loss allowance
ROCHE HOLDING LTD	Pharmaceuticals and diagnostics	Finance Report 2024	31 December 2024	Trade receivables matrix, expected loss rates, concentrations and 12-month ECL for cash
BAYER AG	Pharmaceuticals, agricultural solutions and consumer health	Annual Report 2024	31 December 2024	Simplified model, expected loss rates, credit-impaired receivables and movement of the allowance
KONINKLIJKE PHILIPS N.V.	Health technologies	Annual Report 2024	31 December 2024	Financial assets, expected credit losses for trade receivables and contract assets, professional judgment
ASTRAZENECA PLC	Biopharmaceuticals	Annual Report and Form 20-F Information 2024	31 December 2024	Simplified approach for trade receivables, lifetime expected credit losses and risk disclosure
DIAGEO PLC	Beverages and consumer goods	Annual Report 2024	30 June 2024	Trade receivables, allowance for expected credit losses and movement of the allowance

Source: Authors' compilation.

The use of a purposive sample has several methodological advantages. First, the financial statements of large public companies contain sufficiently detailed notes on financial instruments, which allows for a real-world testing of the framework. Second, the different sectors provide a check on whether the index can be applied beyond a single industry context. Third, the inclusion of companies with different trade receivables structures allows for the assessment of the role of the simplified approach and the provision matrix. Fourth, the inclusion of companies with debt instruments, deposits, cash and different counterparties allows for the examination of the relationship between the general approach and risk disclosure. Fifth, the public nature of the financial statements creates an opportunity for another researcher to repeat the assessment procedure. The limitation is that the analysis remains based on publicly available information and does not allow for the examination of the internal models of the companies. The reports cover the respective 2024 fiscal years; the reporting dates are not fully uniform.

5.2. Scoring System and Main Results

For the purposes of empirical application, an index of integration of expected credit losses and risk disclosure is developed. The index does not measure the overall quality of financial reporting and is not an assessment of the actual level of credit risk. Its purpose is to determine the extent to which public disclosures allow the relationship between the classification of financial assets, the measurement basis, the impairment approach, the loss allowance and credit risk information to be traced. Each indicator is scored on a three-point scale: 0 points for no identifiable disclosure, 1 point for general or partial disclosure and 2 points for specific, quantitative or methodologically traceable disclosure. The maximum score is 20 points, as 10 indicators with a maximum score of 2 points were used. For each

enterprise, $n = 10$ indicators are used. The sample comprises $N = 10$ enterprises. For the purposes of the index, the unit of analysis is the enterprise–indicator observation. The maximum score is 200 points. Since all enterprises are assessed using the same indicators and weights, the score is algebraically equivalent to the average of the ten individual indices. All calculations are performed using unrounded integer score totals, and only the final reported percentages are presented to two decimal places. The index is calculated using the following formula:

$$I = \frac{\sum_{i=1}^n S_i}{S_{\max}} \cdot 100$$

In the formula, I is the disclosure integration index, S_i is the score for the individual indicator, $S_{\max}$ is the maximum possible score, and n is the number of indicators used. Thus, the value of the index shows the public integration between expected credit losses and risk disclosure, with the result presented in percentages.

Table 7 presents the indicators used to assess the degree of integration between expected credit losses and risk disclosure. The indicators are designed to follow the logic of the integrated framework. The first group of indicators checks whether accounting policies, categories of financial assets and measurement bases are disclosed. The second group checks whether the impairment approach, loss allowance and movement of the allowance are presented. The third group focuses on trade receivables, the simplified approach, the provision matrix and the ageing structure. The fourth group covers credit risk disclosure, concentrations, forward-looking adjustments and key ECL inputs and assumptions. Quantitative sensitivity information is reviewed descriptively where available but is not scored as a separate universal requirement. The equal weighting of the indicators was chosen to make the tool easy to apply and to be replicated by other researchers without introducing additional subjective weights. The ten indicators cover the key elements of the four modules. They can be tracked through public financial statements. Indicators that require internal data or cannot be applied consistently to all enterprises in the sample have not been included.

Table 7. Matrix for assessing the integration between expected credit losses and risk disclosure.

Nº	Indicator	Score 0	Score 1	Score 2
1	Accounting policy for financial assets disclosed	missing	general policy	specific policy by category
2	Categories and measurement bases of financial assets are specified	missing	partially	clearly defined categories
3	The expected credit loss approach is described	missing	general description	general or simplified approach with parameters
4	Loss allowance disclosed	missing	total amount only	specific amount by asset class or risk category
5	The movement in the loss allowance is presented	missing	partially	tabular or clearly traceable movement
6	Information on trade receivables and past-due balances is presented.	missing	general description	ageing structure or credit quality
7	A provision matrix or equivalent approach is described	missing	partially	portfolios/groups, percentages or parameters
8	Forward-looking information or macroeconomic adjustment used	missing	general mention	described source or adjustment method
9	Concentrations, collateral or credit limits are disclosed	missing	partially	specific quantitative or qualitative data
10	Key ECL inputs and assumptions are identified	missing	general or implicit description	clearly identified inputs, assumptions, parameters or estimation techniques

Source: Authors' compilation.

To limit the risk of the indicators being perceived as an arbitrary author-developed scale, Table 8 links each indicator to a specific module of the framework. It also links each indicator to an expected evidentiary trail in the public report. This matrix supports the content relevance of the index because it shows how the individual assessment elements arise from the logic of “classification-measurement-impairment-disclosure”. It allows another researcher to apply the same indicators to a different sample without changing the basic structure of the assessment. It does not introduce new regulatory requirements but systematises publicly observable manifestations of existing reporting and disclosure requirements. Thus, the index is used as a tool for public traceability and not as a substitute for an internal credit risk model. The evidentiary trail is sought in notes on financial instruments, accounting policies, trade receivables, impairment, movements in loss allowances and risk management. When such a trail is not clearly identifiable, conservative scoring is applied.

Table 8. Relationship between indicators, framework modules and evidence trail.

Nº	Indicator	Framework Module	Expected Evidence Trail
1	Accounting policy for financial assets	Classification/Measurement	Note on accounting policies and financial instruments
2	Categories and measurement bases	Classification/Measurement	Table or note with classes of financial assets and measurement categories
3	Expected credit loss approach	Impairment	Impairment note, ECL or financial risk
4	Loss allowance	Impairment	Loss allowance table or accounting note
5	Movement in loss allowance	Impairment	Movement in the loss allowance by asset class or risk group
6	Trade receivables and past-due balances	Impairment/Disclosure	Ageing analysis, past-due balances or credit quality of trade receivables
7	Provision matrix or equivalent approach	Impairment	Provision matrix, portfolio grouping or method description
8	Forward-looking information or macroeconomic adjustment	Impairment/Disclosure	Description of macroeconomic factors, ratings, scenarios or management adjustments
9	Concentrations, collateral or credit limits	Disclosure	Information about major clients, counterparties, collateral, limits or credit-rating groups
10	Key ECL inputs and assumptions	Disclosure	Clearly identified inputs, assumptions, parameters, estimation techniques or changes therein

Source: Authors' compilation.

The index allows the framework to be applied to public reports, even when public information does not allow for recalculation of all components of expected credit losses. Its application is based on scoring rules that define how scores 0, 1 and 2 are assigned. A zero score is assigned only when the relevant element is missing or cannot be reliably identified in the public report. An intermediate score is assigned when there is a general description, partial accounting policy or limited disclosure without sufficient quantitative traceability. A maximum score is assigned when there is a specific table, movement of the loss allowance, ageing analysis, exposure segmentation, parameters or a clear description of the assumptions used. When a disclosure is ambiguous, a conservative score is applied, and a higher score is assigned only when a clear link between the accounting estimate and the risk disclosure is demonstrated. This rule limits subjectivity and makes the index more verifiable. Thus, the empirical section maintains a connection with the framework without claiming to recalculate the internal models of the enterprises.

For a clearer interpretation, the index is also considered through four sub-indices. The first sub-index covers classification and measurement. The second sub-index covers impairment and expected credit losses. The third sub-index covers trade receivables and the provision matrix. The fourth sub-index covers risk disclosure. This grouping does not change the general formula of the index but allows us to establish where the strength or weakness of public disclosures is concentrated. Thus, the overall result is not interpreted mechanically but is considered at separate analytical levels. The sub-indices have a descriptive function and do not introduce additional weights.

After applying the scoring matrix, the results presented in Table 9 are obtained. They indicate the extent to which the selected entities provide publicly traceable information on expected credit losses and credit risk. The results are not to be interpreted as a ranking of entities by actual credit risk. They are to be interpreted as an assessment of the integration between accounting classification, loss allowance, impairment methods and risk disclosures. The average value of the index in the sample remains high, indicating that the analysed entities disclose the main elements of the framework. However, there are differences between the individual indicators, especially in the methods used to incorporate forward-looking information and in detailed provision-matrix or equivalent-method disclosures. These differences are methodologically significant because they indicate where public traceability is stronger and where weaknesses in risk disclosure remain. The entity-level evidence supporting the scores reported in Table 9 is documented in Appendix A.

Table 9. Results of the integration index.

Company	Classes /Measurement (4)	ECL (6)	Receivables (4)	Risk (6)	Total (20)	Index
BASF SE	4	6	3	6	19	95.00%
NESTLÉ S.A.	4	5	4	5	18	90.00%
ADIDAS AG	4	6	4	6	20	100.00%
AIRBUS SE	4	6	3	4	17	85.00%
SIEMENS AG	4	6	4	6	20	100.00%
ROCHE HOLDING LTD	4	6	4	6	20	100.00%
BAYER AG	4	6	4	6	20	100.00%
KONINKLIJKE PHILIPS N.V.	4	6	3	3	16	80.00%
ASTRAZENECA PLC	4	6	4	6	20	100.00%
DIAGEO PLC	4	6	3	5	18	90.00%
Average value	4.00	5.90	3.60	5.30	18.80	94.00%

Source: Authors' compilation.

The corresponding average module sub-indices are 100.00% for classification and measurement (40/40), 98.33% for ECL (59/60), 90.00% for receivables (36/40) and 88.33% for risk disclosure (53/60).

The results show that the components related to accounting policy, financial asset categories and the description of the impairment approach are the best developed. This is expected because these elements are usually contained in the accounting policy and in the notes on financial instruments. A lower relative assessment is observed for indicators that require a higher degree of specificity, such as the method used for forward-looking adjustment and the detailed traceability of the provision-matrix or equivalent approach. For some enterprises, trade receivables are well represented through an ageing structure, expected loss rates or movement of the allowance. For other enterprises, the information is sufficient for a general assessment but does not allow for a full reproduction of the internal logic of expected credit losses. This shows that the index measures the public transparency of disclosures rather than the internal accuracy of the valuation models.

Table 10 summarises the key observations from the empirical application. The aim is not to reproduce the entire content of the annual reports but to show which reporting elements activate the individual components of the framework. For each entity, only those disclosures that have a direct link to expected credit losses, loss allowance, financial assets and risk disclosures are extracted. This allows the table to serve as an evidentiary bridge between the index and the specific public reports. Observations show that higher-scoring entities tend to link accounting policies, trade receivables, credit quality and loss allowance in a more traceable system. Lower-scoring entities do not necessarily have higher credit risk but rather provide more aggregated or less methodologically traceable disclosures.

Table 10. Key observations from the empirical application by entity.

Company	Key Disclosures	Interpretation Within the Framework
BASF SE	General and simplified approaches, trade receivables, credit ratings, and concentrations.	Good relationship between impairment and credit risk.
NESTLÉ S.A.	Financial asset categories, loss allowances, and credit quality.	Strong link between policy, loss allowance and risk.
ADIDAS AG	Simplified approach, portfolios, geographical regions and macroeconomic factors.	Well-developed application of the model to trade receivables.
AIRBUS SE	Trade receivables, contract assets, low credit risk and milestones.	Clear stage and ageing disclosures; detailed provision-matrix information and an ECL-specific forward-looking adjustment method were not identified.
SIEMENS AG	Credit-rating groups, collateral, movement in loss allowances and investments.	A clear example of an industrial group with different exposures.
ROCHE HOLDING LTD	Provision matrix, loss rates, concentrations and 12-month ECL.	Highly integrated disclosure between receivables, impairment and risk.
BAYER AG	Gross values, adjustments, credit-impaired items and risk.	High traceability of loss allowance.
KONINKLIJKE PHILIPS N.V.	Asset categories, expected credit losses and measurement uncertainty.	Professional judgment is emphasised, while a detailed provision matrix and an ECL-specific forward-looking adjustment method are not identified.
ASTRAZENECA PLC	Simplified approach, lifetime ECL and financial risk.	Demonstrates applicability to an international customer profile.
DIAGEO PLC	Net presentation of receivables and movement of the allowance.	The principal ECL inputs are identified, but the provision-matrix and forward-looking adjustment methods remain aggregated.

Source: Authors' compilation.

In the sample studied, the framework was applicable both to trade receivables with a more standard structure and to more complex financial assets and credit exposures. The highest information utility is observed when the disclosures contain not only general accounting policies but also specific data on the loss allowance, credit quality, concentrations and parameters used. When the information is aggregated, the index captures partial integration but does not award a maximum score. This approach is deliberately conservative and reduces the risk of overestimating reporting transparency. The purposive sample shows that differences between companies are not only due to sector but also to the way in which the notes to the financial statements are structured. This confirms the need to apply the framework through a predefined protocol rather than through free interpretation.

5.3. Interpretation and Checks by Excluding Indicators

The empirical application shows that the integrated framework can be applied to public annual reports without access to internal company databases. This is important because public financial statements often do not allow for the recalculation of expected credit losses, but they do allow for an assessment of the public traceability of disclosures. The first main result is that the classification and measurement module is generally more visible in the reports. Companies present classes of financial assets, measurement bases and accounting policies, as these elements are a standard part of the notes to financial instruments. The second result is that the impairment module is developed differently across companies, especially when looking for a relationship between the loss allowance, trade receivables and forward-looking assumptions. The third result is that risk disclosures often contain information on concentrations, limits, ratings, or collateral and generally identify key ECL inputs. However, the methods used for forward-looking adjustment are not always described in sufficient detail. The framework therefore identifies not only the presence of disclosures but also the extent to which they are linked in an analytically consistent system.

To examine how the average index responds to selected indicator exclusions, a limited indicator-exclusion check was performed. It does not aim at statistical validation. The first alternative specification excludes indicator 10 on key ECL inputs and assumptions. The second excludes both the forward-looking-information indicator and indicator 10. The third includes only indicators 1 through 7. The average changes only marginally when indicator 10 is excluded and increases when indicators 8 and 10 are jointly excluded. These changes are descriptive and should not be interpreted as independent evidence of reliability. Using unrounded score totals, the four specifications are calculated as 188/200, 169/180, 155/160 and 135/140, respectively; the denominators reflect ten entities multiplied by the applicable maximum score per entity.

The results of the indicator-exclusion checks are presented in Table 11.

Table 11. Indicator-exclusion checks for the integration index.

Variant	Maximum Score	Average Value	Interpretation
Main index	20	94.00%	Baseline assessment of public traceability in a purposive sample of ten enterprises.
Without indicator 10	18	93.89%	The average changes only marginally after excluding key ECL inputs and assumptions.
Without indicators 8 and 10	16	96.88%	The average increases when two lower-scored indicators are removed; this is a descriptive result, not an independent validation.
Only indicators 1–7	14	96.43%	The average for the classification, measurement, impairment and receivables indicators remains high under this restricted set.

Source: Authors' compilation. Note: The mean bootstrap value was 94.00%. The resulting 95% percentile interval was 89.50–98.00%.

The index shows that the analysed companies provide significant information on accounting policies, valuation categories, impairment approaches and credit risk exposures. At the same time, the application shows that not all elements of disclosure are equally developed. The largest differences are observed in the methods used for forward-looking adjustment and in the detailed traceability of provision-matrix or equivalent approaches. In the sample, these differences are observed in more than one sector. The result is not

used for statistical generalisation. Within the studied sample, the application supports the practical usability of the framework and simultaneously outlines the limits of its use.

A pronounced ceiling effect is observed: 90 of the 100 indicator scores are 2, 8 are 1, and 2 are 0. This pattern is consistent with the purposive selection of large entities with comparatively extensive public reporting and limits the scale's ability to differentiate between companies. A score of 100% therefore means that an entity met all thresholds of the present scale; it does not establish complete disclosure or full compliance in every respect.

Agreement was found in 27 of 30 re-evaluated observations, or 90.0%. Cohen's kappa was 0.703.

6. Discussion

6.1. Interpretation of Results

The empirical application shows that the integrated framework allows a consistent transition from the contractual analysis of the financial asset to its classification, subsequent measurement, impairment and disclosure. This consistency is essential because the application of IFRS 9 cannot be reduced solely to the calculation of expected credit losses. Before determining the amount of the loss allowance, it should be established whether the financial asset gives rise to contractual cash flows that are solely payments of principal and interest. The business model for managing the asset should also be identified. Only then can the applicable measurement category and the corresponding impairment regime be justified. For non-financial enterprises, trade receivables and intra-group loans constitute potentially relevant credit-risk exposures to which the framework may be applied. Non-financial enterprises often do not have bank internal rating systems but maintain financial assets where credit risk may be significant. The treatment of trade receivables is particularly relevant. Although they are generally short-term assets, the associated loss allowances may be material and are influenced by past-due groups and forward-looking macroeconomic adjustments (Salazar et al. 2023). This shows that the simplified approach should not be viewed merely as a technical accounting procedure. It requires segmentation of receivables and an assessment of historical experience, while current and expected macroeconomic conditions must be incorporated during periods of economic disruption (López-Espinosa and Penalva 2023).

This procedure improves the traceability of forecast adjustments. It does not require a banking model, but it does require a relationship between the selected factor, the specific portfolio, and the amount of the adjustment.

The main advantage of the proposed framework is the integration of four procedures that are often applied separately in practice: classification, measurement, impairment and disclosure. When these procedures are considered separately, the risk of formal compliance with the standard increases, but with limited analytical utility. For example, a financial asset may be correctly classified, but its impairment may be calculated without sufficiently justified forward-looking assumptions (Buesa et al. 2023). Integrating these procedures creates a traceable link between accounting policy, risk assessment and disclosure. This approach also has implications for the quality of professional judgment. IFRS 9 requires the use of reasonable and supportable information that is available without undue cost or effort. This means that professional judgment cannot be arbitrary (Resende et al. 2024). It should be documented, justified and consistently applied.

Empirical application shows that the size of the allowance alone does not provide sufficient traceability. The informational usefulness increases when it is related to delinquencies, concentrations, allowance movement and underlying ECL assumptions.

6.2. Contribution to Literature and Practice

The proposed framework contributes to the literature in several ways. First, the framework extends the analysis of IFRS 9 to non-financial entities. Second, the framework links the classification logic of IFRS 9 to the measurement of expected credit losses. In a significant portion of the literature, these two topics are considered relatively independent. The current framework assumes that the SPPI assessment and the business model are not only inputs to the measurement category but also prerequisites for understanding credit risk exposure. Third, the framework includes disclosure as an equivalent analytical element. This distinguishes the proposed framework from approaches where the calculation of expected credit losses is primarily considered as an accounting estimate (Taylor and Aubert 2022). Evidence on IFRS 7 adoption also indicates that mandatory risk disclosure can influence risk-taking behaviour (Lobo et al. 2024). This link is particularly relevant in light of regulatory findings on the need for greater comparability, transparency and clarity of credit risk disclosures. The practical contribution is that the framework can be used in the development of accounting policies, internal impairment procedures, and working files for expected credit loss calculations. It can also support audit documentation and explanatory notes to the financial statements. This supports both the accounting function and risk management, internal control and the external audit process. The framework differs from standard disclosure checklists and indices. This is because it traces the link between the classification of a financial asset, its measurement, ECL and the subsequent disclosure.

For non-financial corporations, financial assets typically arise through the underlying business activities. Trade receivables arise from sales. Cash and deposits are held for operational liquidity. Intra-group loans are often used for intra-group financing. Debt instruments may be held to manage free cash flow. Despite this operational nature, these exposures may give rise to credit risk and may interact with corporate financing conditions and debt structure (Li et al. 2024). The framework shows that credit risk for non-financial corporations should be assessed differently.

Cash held with a bank with low credit risk may remain in Stage 1 and give rise to limited effects from expected credit losses. An intra-group loan to an entity in financial distress may require recognition of lifetime expected credit losses. Trade receivables require a portfolio approach using a provision matrix. Debt instruments should be analysed from both a classification and a credit risk perspective. It is therefore not sufficient to apply a single general impairment rate to all financial assets. A framework that takes into account the different nature of exposures is needed. The proposed framework addresses this need by distinguishing between a general approach, a simplified approach and assets outside the expected credit loss model.

6.3. Verifiability and Limitations

The methodological transparency of the framework is supported by several features. First, it is built on the normative logic of IFRS 9 and IFRS 7 and does not introduce an alternative accounting category or a new measurement basis. Second, it has a clearly defined scope, as it is intended for non-financial entities and does not claim to replace the specialised models of banks or other financial institutions. Third, the empirical application is presented as an empirical application based on public reports and not as statistical evidence for all enterprises. Fourth, the index is accompanied by a formula, rules for assigning scores, a matrix for substantiating the indicators, an evidentiary trail and indicator-exclusion checks. Fifth, each assigned score should be traceable to a publicly observable element of the report, which reduces the risk of free interpretation. These features do not eliminate all limitations, but they make the framework sufficiently transparent, structured and applicable for methodological and empirical research.

The results obtained should be interpreted with caution. The sample used is purposive and includes ten large public non-financial corporations; therefore, the results do not statistically represent the entire population of non-financial corporations. Public reports do not always allow for the recalculation of the probability of default, loss given default and exposure at default. Therefore, the results should not be considered as an empirical assessment of the actual level of credit risk. The index measures the public traceability and completeness of disclosures, not the economic accuracy of the internal assessments of the companies. Additional limitations arise from the concentration of ratings near the upper end of the scale and the lack of access to internal working files, management models, and audit procedures. However, the limitations are compatible with the aim of the study. The study is intended to develop and apply a transparent framework for analysing public disclosures rather than to validate internal models for expected credit losses. The observed ceiling effect limits the scale's discriminatory power. The three-point scale has been retained, as the assessment criteria were defined prior to the analysis. A more detailed scale should be tested in future applications of the index.

The content validity of the index is supported by direct mapping of the indicators to the framework modules and to the evidence trail. External criterion validity against an independent measure of the content quality of financial reporting has not been examined. Future research should also examine the applicability of the framework to smaller and non-listed entities.

Financial assets may be analysed not only as accounting items but also as sources of credit risk, measurement uncertainty and reporting volatility (Lim et al. 2026). In this way, a link is created between contractual cash flows, the business model, subsequent measurement, expected credit losses and financial risk information. The integrated framework does not claim to be a universal solution for all types of financial instruments. Its value lies in the fact that it offers a consistent, verifiable and applicable structure for non-financial entities. It is in this area that a need for a clearer connection between the regulatory requirements of IFRS 9, the practical measurement of expected credit losses and the disclosures under IFRS 7 is observed. This result also outlines the main field for future comparative research.

7. Conclusions

7.1. Main Results

The analysis, based on the development and application of the framework, showed that the classification of financial assets plays a fundamental role. The SPPI assessment and the business model determine the category of the financial asset. From these arise the subsequent measurement basis, the applicable impairment regime and the required disclosures. The empirical application showed that the analysed companies provide significant information on trade receivables, ECL, financial assets with low credit risk, loss allowance and credit risk concentrations. At the same time, the relationship between forward-looking assumptions, movement of the allowance and risk disclosure remains unevenly developed across corporations. The mean index value was 94.00%. Independent re-evaluation showed 90.0% agreement, and Cohen's kappa was 0.703.

7.2. Scientific Contribution and Practical Applicability

The scientific contribution of the article consists in systematising the relationships between regulatory requirements, credit risk measurement and reporting transparency in non-financial enterprises. The contribution does not consist of a new interpretation of a separate requirement of IFRS 9 or IFRS 7. It consists of the development of an application consistency and evaluation system through which public financial statements can be analysed comparably. The practical applicability is expressed in the fact that the framework

can be used in the preparation of accounting policies, internal working files, audit tests and comparative analysis of risk disclosures.

It can provide traceability between the contractual characteristics of the financial asset, the business model, the measurement category, the chosen impairment approach and the disclosed risk information. The practical value of the framework is also expressed in its adaptability. It can be applied to cash, deposits, trade receivables, intra-group loans and debt instruments. A separate classification layer can also account for the impact of contingent contractual characteristics, including characteristics related to sustainability or other indicators that affect the amount or timing of contractual cash flows. This makes the framework applicable both for reporting preparation and for comparative analysis of public disclosures. The limitation is that its application requires sufficiently reliable and documented input information.

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Abbreviations

The following abbreviations are used in this manuscript:

DF	Discount factor
EAD	Exposure at default
ECL	Expected credit losses
ESG	Environmental, social and governance
GCA	Gross carrying amount
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
LA	Loss allowance
LGD	Loss given default
LR	Expected credit loss rate

PD	Probability of default
SICR	Significant increase in credit risk
SPPI	Solely payments of principal and interest

Appendix A. Evidence Trail for the Empirical Assessment

The appendix presents an entity-level evidence map and an indicator-level score matrix. The evidence map identifies the official report, reporting date, relevant note or page locations and the principal disclosures used in the assessment. The score matrix records the score assigned to each indicator. The appendix does not constitute a secondary audit and does not validate the entities' internal ECL models. Where disclosure was general or aggregated, an intermediate score was assigned; where sufficient public evidence was not identified, the score was not increased on the basis of assumptions.

Table A1. Empirical data sources and entity-level evidence map.

Enterprise	Reporting Date	Official Report and Evidence Location	Principal Evidence and Indicator Coverage
BASF SE	31 December 2024	BASF Report 2024; Notes 17 and 25.1–25.2; pp. 392–93, 412–14 and 418.	Categories; general and simplified ECL; allowance movement; ratings; regional and industry factors; limits and collateral. Indicators 1–6 and 8–10 are fully supported; Indicator 7 is partially supported.
NESTLÉ S.A.	31 December 2024	Financial Statements 2024; Notes 7.1 and 12; pp. 103, 129–30 and 137.	Simplified lifetime ECL; three-to-five-year loss experience and forward-looking adjustment; allowance amount; concentrations and limits. Indicators 1–4, 6–7 and 9–10 are fully supported; Indicators 5 and 8 are partially supported.
ADIDAS AG	31 December 2024	Annual Report 2024—Notes; pp. 370–71, 377–78, 386 and 428.	Categories; portfolio grouping by geography and macroeconomic indicators; PD, LGD and EAD; loss rates; allowance movement; concentration and mitigation. Indicators 1–10 are fully supported.
AIRBUS SE	31 December 2024	Financial Statements 2024; Note 37.1–37.2 and 37.7; pp. 72–73 and 80–81.	Categories; general and simplified ECL; rating-based SICR; allowance movement; ageing and limits. Indicators 1–6 and 9–10 are fully supported; Indicator 7 is partially supported; Indicator 8 is not identified in the ECL disclosures reviewed.
SIEMENS AG	30 September 2024	Annual Financial Report 2024; Financial-instrument and credit-risk notes; pp. 55, 74 and 79–80.	Categories; explicit ECL parameters; stage-based allowance movement; internal and external ratings; forward-looking factors; collateral and limits. Indicators 1–10 are fully supported.
ROCHE HOLDING LTD	31 December 2024	Finance Report 2024; Notes 12, 31 and 34; pp. 85, 124–26 and 152–54.	Allowance movement; allowance matrix and explicit loss rates; concentrations; 12-month ECL for cash; categories and ECL assumptions. Indicators 1–10 are fully supported.
BAYER AG	31 December 2024	Annual Report 2024; Financial-instrument and receivables notes; pp. 271, 304–6 and 327–30.	Categories; portfolio-specific default rates; historical and forward-looking inputs; allowance movement; loss-rate bands; insurance and collateral. Indicators 1–10 are fully supported.
KONINKLIJKE PHILIPS N.V.	31 December 2024	Annual Report 2024; Notes on financial assets, trade receivables and financial risk; pp. 119, 122 and 153–54.	Categories; 12-month and lifetime ECL; allowance movement; past-due receivables; limits and mitigation. Indicators 1–6 and 9 are fully supported; Indicators 7 and 10 are partially supported; Indicator 8 is not identified in the ECL disclosures reviewed.

Table A1. *Cont.*

Enterprise	Reporting Date	Official Report and Evidence Location	Principal Evidence and Indicator Coverage
ASTRAZENECA PLC	31 December 2024	Annual Report and Form 20-F Information 2024; Note 28; pp. 198–99.	Simplified lifetime ECL; 36-month payment profiles; macroeconomic adjustment; explicit loss rates; allowance movement; customer concentration and limits. Indicators 1–10 are fully supported.
DIAGEO PLC	30 June 2024	Annual Report 2024—Financial Statements; Notes 13, 15 and 19; pp. 189, 194 and 198–99.	Categories; expected-loss policy; ageing and allowance movement; concentrations, limits and collateral. Indicators 1–6 and 9–10 are fully supported; Indicators 7 and 8 are partially supported.

Source: Authors' compilation from the official annual reports linked in the table.

Table A2. Indicator-level score matrix.

Enterprise	Indicator	Score
BASF SE	1. Accounting policy	2
BASF SE	2. Categories and measurement bases	2
BASF SE	3. ECL approach	2
BASF SE	4. Loss allowance	2
BASF SE	5. Movement in loss allowance	2
BASF SE	6. Trade receivables and past-due balances	2
BASF SE	7. Provision matrix/equivalent	1
BASF SE	8. Forward-looking information	2
BASF SE	9. Concentrations/collateral/limits	2
BASF SE	10. Key ECL inputs and assumptions	2
NESTLÉ S.A.	1. Accounting policy	2
NESTLÉ S.A.	2. Categories and measurement bases	2
NESTLÉ S.A.	3. ECL approach	2
NESTLÉ S.A.	4. Loss allowance	2
NESTLÉ S.A.	5. Movement in loss allowance	1
NESTLÉ S.A.	6. Trade receivables and past-due balances	2
NESTLÉ S.A.	7. Provision matrix/equivalent	2
NESTLÉ S.A.	8. Forward-looking information	1
NESTLÉ S.A.	9. Concentrations/collateral/limits	2
NESTLÉ S.A.	10. Key ECL inputs and assumptions	2
ADIDAS AG	1. Accounting policy	2
ADIDAS AG	2. Categories and measurement bases	2
ADIDAS AG	3. ECL approach	2
ADIDAS AG	4. Loss allowance	2
ADIDAS AG	5. Movement in loss allowance	2
ADIDAS AG	6. Trade receivables and past-due balances	2
ADIDAS AG	7. Provision matrix/equivalent	2
ADIDAS AG	8. Forward-looking information	2
ADIDAS AG	9. Concentrations/collateral/limits	2
ADIDAS AG	10. Key ECL inputs and assumptions	2
AIRBUS SE	1. Accounting policy	2
AIRBUS SE	2. Categories and measurement bases	2
AIRBUS SE	3. ECL approach	2
AIRBUS SE	4. Loss allowance	2
AIRBUS SE	5. Movement in loss allowance	2
AIRBUS SE	6. Trade receivables and past-due balances	2
AIRBUS SE	7. Provision matrix/equivalent	1

Table A2. Cont.

Enterprise	Indicator	Score
AIRBUS SE	8. Forward-looking information	0
AIRBUS SE	9. Concentrations/collateral/limits	2
AIRBUS SE	10. Key ECL inputs and assumptions	2
SIEMENS AG	1. Accounting policy	2
SIEMENS AG	2. Categories and measurement bases	2
SIEMENS AG	3. ECL approach	2
SIEMENS AG	4. Loss allowance	2
SIEMENS AG	5. Movement in loss allowance	2
SIEMENS AG	6. Trade receivables and past-due balances	2
SIEMENS AG	7. Provision matrix/equivalent	2
SIEMENS AG	8. Forward-looking information	2
SIEMENS AG	9. Concentrations/collateral/limits	2
SIEMENS AG	10. Key ECL inputs and assumptions	2
ROCHE HOLDING LTD	1. Accounting policy	2
ROCHE HOLDING LTD	2. Categories and measurement bases	2
ROCHE HOLDING LTD	3. ECL approach	2
ROCHE HOLDING LTD	4. Loss allowance	2
ROCHE HOLDING LTD	5. Movement in loss allowance	2
ROCHE HOLDING LTD	6. Trade receivables and past-due balances	2
ROCHE HOLDING LTD	7. Provision matrix/equivalent	2
ROCHE HOLDING LTD	8. Forward-looking information	2
ROCHE HOLDING LTD	9. Concentrations/collateral/limits	2
ROCHE HOLDING LTD	10. Key ECL inputs and assumptions	2
BAYER AG	1. Accounting policy	2
BAYER AG	2. Categories and measurement bases	2
BAYER AG	3. ECL approach	2
BAYER AG	4. Loss allowance	2
BAYER AG	5. Movement in loss allowance	2
BAYER AG	6. Trade receivables and past-due balances	2
BAYER AG	7. Provision matrix/equivalent	2
BAYER AG	8. Forward-looking information	2
BAYER AG	9. Concentrations/collateral/limits	2
BAYER AG	10. Key ECL inputs and assumptions	2
KONINKLIJKE PHILIPS N.V.	1. Accounting policy	2
KONINKLIJKE PHILIPS N.V.	2. Categories and measurement bases	2
KONINKLIJKE PHILIPS N.V.	3. ECL approach	2
KONINKLIJKE PHILIPS N.V.	4. Loss allowance	2
KONINKLIJKE PHILIPS N.V.	5. Movement in loss allowance	2
KONINKLIJKE PHILIPS N.V.	6. Trade receivables and past-due balances	2
KONINKLIJKE PHILIPS N.V.	7. Provision matrix/equivalent	1
KONINKLIJKE PHILIPS N.V.	8. Forward-looking information	0
KONINKLIJKE PHILIPS N.V.	9. Concentrations/collateral/limits	2
KONINKLIJKE PHILIPS N.V.	10. Key ECL inputs and assumptions	1
ASTRAZENECA PLC	1. Accounting policy	2
ASTRAZENECA PLC	2. Categories and measurement bases	2
ASTRAZENECA PLC	3. ECL approach	2
ASTRAZENECA PLC	4. Loss allowance	2
ASTRAZENECA PLC	5. Movement in loss allowance	2
ASTRAZENECA PLC	6. Trade receivables and past-due balances	2
ASTRAZENECA PLC	7. Provision matrix/equivalent	2
ASTRAZENECA PLC	8. Forward-looking information	2
ASTRAZENECA PLC	9. Concentrations/collateral/limits	2
ASTRAZENECA PLC	10. Key ECL inputs and assumptions	2
DIAGEO PLC	1. Accounting policy	2
DIAGEO PLC	2. Categories and measurement bases	2

Table A2. *Cont.*

Enterprise	Indicator	Score
DIAGEO PLC	3. ECL approach	2
DIAGEO PLC	4. Loss allowance	2
DIAGEO PLC	5. Movement in loss allowance	2
DIAGEO PLC	6. Trade receivables and past-due balances	2
DIAGEO PLC	7. Provision matrix/equivalent	1
DIAGEO PLC	8. Forward-looking information	1
DIAGEO PLC	9. Concentrations/collateral/limits	2
DIAGEO PLC	10. Key ECL inputs and assumptions	2

Source: Authors' compilation.

The evidence map shows that the high scores stem mainly from specific accounting policies, financial-asset categories, loss-allowance information and credit-risk disclosures. Intermediate and zero scores are concentrated in detailed provision-matrix or equivalent-method disclosures and in the description of forward-looking adjustments. The appendix therefore improves public traceability of the assessment, but it does not replace an audit review.

Appendix B. Illustrative Applications of the Framework

The appendix presents illustrative examples that show how the framework can be applied to typical financial assets of a non-financial entity. The illustrations have a methodological function and do not represent an empirical sample. They demonstrate the sequential transition from contractual analysis to classification, measurement, impairment and disclosure. The illustrations combine conceptual explanations with hypothetical numerical examples that demonstrate the operation of the formulas. Each case can be replaced with entity-specific data when such data are available. In public reports, the application of the illustrations should be limited to information that can be reliably traced. In this way, the appendix complements the empirical application without duplicating it.

Table A3. Illustrative applications and their relationship to the framework modules.

Illustration	Analytical Logic	Framework Connection
SPPI assessment for intra-group loan	It is checked whether the contractual cash flows are solely payments of principal and interest, including in the case of zero contractual interest or reasonable compensation for early repayment.	Classification
Bonds, intra-group loans and cash	Assets held to collect contractual cash flows are compared with assets held both for collection and sale.	Classification and measurement
Cash and deposits	Expected credit losses are determined by exposure, probability of default and loss given default, taking into account the credit rating or other reliable indicator.	Impairment
Trade receivables	Receivables are grouped by ageing structure and customer segment; historical loss rates are adjusted with forward-looking information.	Simplified approach and disclosure

Source: Authors' compilation.

Illustration B1 shows how the SPPI assessment is applied. In the case of an intra-group loan without contractual interest, the analysis does not end with the technical determination that there is no interest payment. It is checked whether the final amount represents the principal repayment and implicit interest calculated using a market discount rate at initial

recognition. If the cash flows do not contain exposure to equities, commodities or financial leverage, the contract may pass the SPPI assessment. The business model is then assessed. If the asset is held to collect contractual cash flows, subsequent measurement is usually at amortised cost. If the asset is managed for sale or at fair value, the outcome may be different.

Illustration B2 applies the classification logic to three common assets: corporate bonds, an intra-group loan and cash held with a bank. Bonds pass the SPPI assessment when the contractual payments are principal and interest. If they are held both to collect contractual cash flows and to sell in response to liquidity needs, the classification may be fair value through other comprehensive income. An intra-group loan held to maturity may be measured at amortised cost when the SPPI assessment is met. Cash is usually treated as a financial asset at amortised cost. This illustration shows why classification should precede the impairment analysis.

Illustration B3 shows the general approach to expected credit losses for cash and deposits. The exposure at default is determined by the gross carrying amount. The probability of default can be derived from an external credit rating or, in the absence of a rating, from an internal assessment. The loss given default is adjusted for the presence of guarantees, collateral or other recovery mechanisms. If credit risk is low and there has been no significant increase since initial recognition, 12-month expected credit losses are used. If credit risk has increased significantly, lifetime expected credit losses are used. This approach requires disclosures to include at least the general logic for the credit quality of the deposit-taking counterparties.

Illustration B4 shows the simplified approach for trade receivables. First, receivables are grouped into portfolios with similar credit risk characteristics. Such characteristics may include geographic region, product type, customer type, collateral, credit insurance or ageing structure. Second, a historical loss rate is assigned to each group. Third, this percentage is adjusted with forward-looking information when changes in the macroeconomic or sector environment are expected. Fourth, the adjusted percentage is applied to the gross carrying amount of receivables at the reporting date. The resulting loss allowance should be linked to disclosures about ageing analysis, past-due status, impairment and movements in the allowance.

Table A4. Hypothetical numerical illustration of the formulas used in the framework.

Formula	Hypothetical Inputs	Calculation and Result
General approach and discount factor	EAD = 1,000,000; PD = 1.5%; LGD = 40%; r = 5%; t = 1	$DF = 1/(1 + 5\%) = 1/1.05$; $ECL = 1,000,000 \times 1.5\% \times 40\% \times (1/1.05) = 5714.29$.
Provision matrix	Current: GCA 800,000, LR 0.5%; 1–30 days: GCA 150,000, LR 2%; over 30 days: GCA 50,000, LR 10%	Group ECL values are 4000, 3000 and 5000; total ECL = 12,000.
Loss-allowance movement	Opening 10,000; additions 8000; reversals 1000; write-offs 3000; foreign-exchange effect 500	Closing allowance = 14,500 and $\Delta LA = 4500$. Assuming additions and reversals are the only profit-or-loss components, the net impairment charge is 7000, demonstrating why the balance change is not identical to impairment expense.
Index calculations	188 points from 100 indicator assessments; maximum 200	$I = 188/200 \times 100 = 94.00\%$. The module sub-indices and indicator-exclusion variants are reported in Tables 9 and 11.

Source: Authors' hypothetical calculations; values do not represent any sampled entity.

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