
A PRACTICE-ORIENTED MODEL FOR THE TRANSFER OF TAX LOSSES IN NON-FINANCIAL ENTERPRISES USING ARTIFICIAL INTELLIGENCE

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Abstract: This paper proposes a practice-oriented model for the application of tax loss carry-forward in non-financial sector enterprises, emphasizing the potential of artificial intelligence (AI) as a tool to ensure compliance with the fundamental accounting principle of true and fair presentation of an entity's financial and asset position. Grounded in the provisions of the Corporate Income Tax Act (CITA), the model enables the carry-forward of tax losses for up to five years, contingent upon achieving a positive taxable financial result and the consistent exercise of this right. Through a practical case study, the study demonstrates the implementation of the model, which includes automated tax loss carry-forward, calculation of tax effects, and accounting for deferred tax assets in accordance with the requirements of International Accounting Standard (IAS) 12 Income Taxes and National Accounting Standard (NAS) 12 Income Taxes. The integration of AI facilitates informed managerial decision-making aimed at minimizing tax liabilities by providing predictive financial outcomes, identifying and correcting accounting errors, and analyzing tax planning scenarios. The model ensures adherence to regulatory requirements, contributing to the sustainable development of enterprises in a competitive economic environment.

Key words: tax loss, artificial intelligence, practice-oriented model, accounting error

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Introduction

Enterprises in the non-financial sector face significant challenges in managing their tax liabilities, particularly in the context of carrying forward tax losses, which can profoundly impact their financial position (Damyanov et al., 2010). This represents a practical opportunity applicable only when a tax loss has been incurred, the effective management of which can facilitate the reduction or increase of future tax obligations, thereby influencing the financial health of the enterprise. In Bulgaria, the Corporate Income Tax Act (CITA) regulates the carry-forward of tax losses for up to five years, provided a subsequent positive taxable financial result is achieved and the right is exercised consecutively (National Assembly of the Republic of Bulgaria, 2006). International research highlights the importance of tax losses in reducing future liabilities but notes variations in regulatory frameworks. For

instance, Graham (2000) examines Net Operating Losses (NOLs) in the United States, observing that flexible carry-forward periods (up to 20 years before 2018) incentivize investments in loss-making enterprises. In the United Kingdom, trading losses can be carried forward indefinitely, subject to restrictions upon changes in company ownership and depending on whether the losses were incurred before or after 2017 (HMRC, 2024).

The accounting treatment of tax losses is governed by IAS 12 Income Taxes, which mandates the recognition of deferred tax assets when future taxable profits are probable (European Union, 2023). Epstein and Mirza (2002) emphasize that accurate recognition of these assets is critical for adhering to the principle of true and fair presentation. However, manual processing of tax losses and the correction of accounting errors often lead to inaccuracies, underscoring the need for automation, including through artificial intelligence (Zhang et al., 2020).

The term “tax loss” refers to a negative taxable financial result derived by adjusting the accounting financial result for permanent and/or temporary tax differences, as well as amounts stipulated in the CITA. This study presents a practice-oriented model designed to clarify the conditions and requirements for the accurate carry-forward of tax losses, incorporating artificial intelligence (AI) to ensure compliance with the fundamental accounting principle of true and fair presentation of the financial and asset position of the reporting entity. The model aligns with the provisions of the CITA and the requirements of applicable accounting standards (IAS 12 Income Taxes and NAS 12 Income Taxes), which govern the accounting treatment of corporate income taxes. Through the analysis of a practical case study involving a non-financial sector enterprise, the study illustrates the application of the model, encompassing automated tax loss carry-forward, calculation of tax effects, and accounting for deferred tax assets. AI is proposed for application in both practice and the education and training of accounting professionals, where “ensuring the institutional capacity of higher education institutions to meet established criteria for maintaining high-quality education” (Stanev, 2024) will equip professionals with skills for forecasting financial outcomes, identifying and correcting accounting errors, and analyzing tax scenarios. This enables managerial teams to make informed decisions to minimize tax liabilities.

The study contributes to both theory and practice by proposing an innovative approach that integrates traditional tax and accounting practices with advanced AI-based technologies. It aims to provide enterprise management with a tool for sustainable financial management in a competitive economic environment, ensuring transparency, regulatory compliance, and maximum tax benefits.

Specifics of the concepts “loss coverage” and “tax loss carry-forward”

It is critical to clarify that tax profit/loss and accounting profit/loss are not equivalent, and only tax losses are eligible for carry-forward. Moreover, there is a distinction between the concepts of “deduction of losses” and “loss coverage.” The accounting and taxable financial results are treated differently. Loss coverage is an accounting operation that offsets part or all of the loss recorded in the balance sheet, typically executed through a decision by the enterprise’s governing body.

The carry-forward or deduction of a tax loss is a non-accounting operation with a tax-related character, performed after completing the annual tax return to determine the taxable financial result for corporate income tax purposes under the CITA (National Assembly of the Republic of Bulgaria, 2006). A tax loss arises when the accounting financial result, adjusted for tax purposes, results in a negative taxable financial result, which is then reported in the annual tax return under Article 92 of the CITA. The carry-forward of tax losses to subsequent tax periods is regulated by Chapter Eleven, “Tax Loss Carry-Forward,” of the CITA.

The concepts of “loss coverage” under the Commercial Law (National Assembly of the Republic of Bulgaria, 1991) and “tax loss carry-forward” under the CITA carry distinct meanings and implications.

Loss coverage under the Commercial Law is always associated with a decision by the enterprise’s governing body and may involve:

- Covering losses through additional monetary contributions from shareholders, proportional to their capital shares, within a specified period (Article 134 of the Commercial Law);
- Covering losses by reducing the enterprise’s capital (Article 202 of the Commercial Law);
- Covering annual losses or losses from previous years (Article 246 of the Commercial Law).

Tax loss carry-forward, however, is a discretionary choice for the enterprise, exercisable only in strict compliance with legal requirements. When a tax loss is incurred, it is deducted from taxable profits consecutively until fully utilized within five years from its occurrence. Two key aspects emerge: the act of carrying forward the loss and the exercise of the right to utilize the tax loss.

Non-financial sector enterprises subject to corporate income tax may carry forward a tax loss for up to five years from its occurrence, provided the right is exercised consecutively in each year with a positive taxable financial result before the deduction of the tax loss. Failure to exercise this right in the first year with a positive taxable financial result results in the forfeiture of the right to recover the tax loss. Additionally, if no positive taxable financial

result is achieved within five consecutive years, it is deemed that the taxable entity has exercised its right to carry forward the tax loss.

In tax practice, three specific cases are identified for carrying forward losses from foreign sources: under the “exemption with progression” method, the “tax credit” method, and in cases involving a controlled foreign company. In the first case, the tax loss is incurred in the current year in a country with which Bulgaria has a Double Tax Avoidance Agreement (DTAA) (National Assembly of the Republic of Bulgaria, 2006). The applicable method for avoiding double taxation for these profits is “exemption with progression.” In both the first and third cases, the tax loss is not deductible from taxable profits derived from domestic or other foreign sources in the current or subsequent years. Common to all three cases is that the tax loss is carried forward:

- Only from taxable profits realized from a foreign source with a place of business in a country with which Bulgaria has a DTAA;
- Consecutively over the subsequent five years.

An additional relief applies only to the carry-forward of a tax loss incurred from a foreign source under the “tax credit” method for avoiding double taxation, where the country of origin of the loss is irrelevant.

Tax losses are not carried forward in the following cases:

- When the right to carry forward is not exercised;
- When the loss is not carried forward at the specified time and amount;
- In cases of transformation under the Commercial Law, where the acquiring or newly established company cannot carry forward a tax loss incurred by the transforming company;
- Upon the sale of an enterprise under Article 15 of the Commercial Law;
- Upon cessation of operations, except in cases under the “exemption with progression” method.

Practice-oriented model for carrying forward tax losses from previous years

The conditions for complying with the legal requirements for carrying forward tax losses from previous years are best illustrated through a practical example:

Consider “ABV” Ltd., an enterprise operating in Bulgaria, which incurred consecutive tax losses from 2016 to 2023. In the reporting year 2024, the enterprise realized a taxable profit. What portion of the accumulated tax losses can be deducted when determining the taxable financial result for 2024?

Given that carrying forward losses results in a reduction of tax liabilities, the CITA establishes a right (opportunity) for the enterprise to reduce its taxable profit by carrying forward losses from previous years. This

right is exercised by deducting the tax loss in the first year following its occurrence in which a positive taxable financial result is achieved before the deduction. The managerial team decides whether to exercise this right or forego it. If the right is not exercised, the enterprise loses the ability to deduct the tax loss in subsequent years. If exercised, the deduction must comply with the procedure outlined in Article 71 of the CITA. The tax loss is deducted when determining the taxable financial result up to the amount of the positive taxable financial result before the deduction. In all cases where the tax loss is less than the positive taxable financial result in the year of deduction, the loss is deducted in its entirety.

The sequence of occurrence is observed for newly incurred tax losses. For each new tax loss, the five-year deduction period begins in the year following its occurrence. Based on legal requirements, if the enterprise does not realize a taxable profit within five consecutive years after incurring a tax loss, it is deemed to have exercised its right to carry forward the tax loss.

In the example, the right to deduct losses from 2016 to 2018 is considered unexercised, as more than five years have elapsed. Thus, from the taxable profit realized in 2024, the enterprise can deduct tax losses from 2019 to 2023, up to the amount of the 2024 taxable profit, adhering to the sequence of their occurrence. For the purposes of this example, it is assumed that the 2024 profit fully covers the accumulated losses from 2019 to 2023. The data, presented through a tax loss carry-forward model, are as follows (Table 1):

Table 1. Tax Loss Carry-Forward Model

Year	Tax profit before carry-forward of the tax loss in the relevant year		Tax loss in the relevant year to be carried forward		Total amount of tax losses from previous years subject to carry-forward		Amount of tax loss deducted in the relevant year		Adjustment of the tax loss for carry-forward under Art. 76		Balance of the tax loss for carry-forward in subsequent years	
2	3.1 Country	3.2 Abroad	4.1 Country	4.2 Abroad	5.1 Country	5.2 Abroad	6.1 Country	6.2 Abroad	7.1 Country	7.2 Abroad	8.1 Country	8.2 Abroad
2016			5000								5000	
2017			4000		5000						9000	
2018			3000		9000						12000	
2019			4000		12000						16000	
2020			8000		16000						24000	
2021			5000		24000						24000	
2022			2000		24000						22000	
2023			1000		22000						20000	
2024	20000				20000		20000				0	

Source: Author's calculations.

If a tax audit by the National Revenue Agency (NRA) was conducted during this period and a valid audit report exists, the amount of the loss to be carried forward is that established in the audit report. Thus, when deducting tax losses, the results from the audited loss for the respective year and the declared tax losses from the annual tax returns for the remaining years are used.

Under applicable accounting standards (IAS 12/NAS 12), deferred tax assets include amounts of income taxes recoverable in future reporting periods related to the carry-forward of unused tax losses. In this sense, tax losses generate temporary tax differences, which are recognized as deferred tax assets. These are accounted for through the following accounting entry:

Debit: Deferred Tax Assets Account

Credit: Current Year Profits and Losses Account

From an accounting perspective, to determine the need for recognizing a deferred tax asset (based on the accountant's judgment and the amount of the realized tax loss), the managerial team decides whether to deduct the loss against a subsequent taxable profit. If there is an expectation of sufficient taxable profit, the team determines the amount of the deferred tax asset up to the value of the realized tax loss, adjusted for applicable tax rates if information is available for the relevant period. Deferred tax assets are not discounted.

Accounting errors and tax adjustments

In practice, accounting errors from previous reporting periods may be identified. Such errors must be corrected in accordance with applicable accounting standards. An accounting error in a financial statement is recognized only when it is unintentional. Otherwise, it constitutes deliberate misconduct, which, depending on its scale and methods, achieves its purpose of distorting economic information to mislead users of the financial statements.

During the preparation of financial statements, inaccuracies and discrepancies may be identified, classified as accounting errors. In line with accounting standards, such errors are subject to correction and disclosure. These errors commonly arise from incorrect initial recording of accounting information, calculation errors, errors in data transfer, misinterpretation or misapplication of regulatory requirements (once duly established), among others. In the latter case, circumstances may suggest intent, automatically classifying the error as a form of misconduct. Intent or deliberate action/inaction by responsible personnel is typically identified following an audit or tax inspection.

Indicators of intent in deliberate errors include:

- Use of illegal practices in managing the enterprise's assets, related to non-compliance with internal rules;
- Amendments to primary accounting documents with questionable appropriateness and unsupported by other transaction-related documents;
- Deviation from the disclosed accounting policy of the enterprise;

- Non-standard interpretation and application of accounting standards, resulting in financial statements containing incomplete or inaccurate data about the enterprise's assets;

- Use of documents with false content, signed under authorization or with forged signatures, for which there is evidence of initiated pre-trial criminal proceedings.

Regardless of the reason for identifying an accounting error, failure to correct it (inaction) renders the financial statement inaccurate. From an accounting perspective, upon identifying an error, corrective and disclosure actions must be taken in accordance with applicable accounting standards, irrespective of pursuing administrative or criminal liability.

NAS 8 *Net Profit or Loss for the Period, Fundamental Errors, and Changes in Accounting Policies* defines fundamental errors as “errors of such significance that the financial statements for one or more prior periods can no longer be considered reliable at the date of their publication.” This definition indicates that the standard addresses only errors of a fundamental nature, necessitating further clarification of specific criteria affecting the reliability of financial statement data at the publication date.

IAS 8 *Accounting Policies, Changes in Accounting Estimates, and Errors* does not provide criteria for classifying the materiality of errors. Beyond being from prior periods, errors are categorized as material or immaterial and may arise in connection with the recognition, measurement, presentation, or disclosure of financial statement elements. For material (fundamental) errors, correction of inaccurate information from prior periods, identified in subsequent periods, is mandatory.

Models for tax loss carry-forward and correction of accounting errors

From a tax perspective, as stipulated in the CITA, when an accounting error from prior years is identified, the taxable financial results for the affected years are adjusted in accordance with applicable laws and tax rates, as if the error had not occurred. Upon identifying and correcting an error that alters the taxable financial result, taxable entities must notify the NRA in writing. Within 30 days of receiving the notification, the NRA takes action to amend the taxable financial result and the tax liability for the relevant tax period. This declaration also applies to errors other than accounting errors, including errors in transforming the accounting financial result for tax purposes and correcting events as defined by applicable accounting standards.

To extend the example in Table 1, consider a case where an accounting error of 10,000 BGN is identified in 2023, following a management decision to cover a tax loss. The error is corrected as unreported revenue of 10,000

BGN for 2022. After correction, it is recorded as an adjustment to the tax loss carry-forward under Article 76, as shown in Table 2:

Table 2. Model for Tax Loss Carry-Forward and Correction of Accounting Error

№	Year	Tax profit before carry-forward of the tax loss in the relevant year		Tax loss in the relevant year to be carried forward		Total amount of tax losses from previous years subject to carry-forward		Amount of tax loss deducted in the relevant year		Adjustment of the tax loss for carry-forward under Art. 76		Balance of the tax loss for carry-forward in subsequent years	
		3.1 Country	3.2 Abroad	4.1 Country	4.2 Abroad	5.1 Country	5.2 Abroad	6.1 Country	6.2 Abroad	7.1 Country	7.2 Abroad	8.1 Country	8.2 Abroad
1	2016			5000								5000	
2	2017			4000		5000						9000	
3	2018			3000		9000						12000	
4	2019			4000		12000						16000	
5	2020			8000		16000						24000	
6	2021			5000		24000						24000	
7	2022			2000		24000				-10000		12000	
8	2023			1000		12000						10000	
9	2024	20000				10000		10000				0	

Source: Author's calculations.

Following the correction of the accounting error and the tax loss carry-forward (Table 2), the enterprise must assess whether the correction affects the taxable or accounting financial result. In this case, no change in the taxable financial result is recorded, so it is not necessary to apply Article 75, paragraph 3 of the CITA or submit a corrective tax return (written notification) to the NRA, as the 2022 accounting error affects only the accounting financial result. When the enterprise has a tax loss in the same period and is entitled to corrections within the stipulated period, the tax loss available for carry-forward in subsequent years is reduced.

The situation differs if the enterprise generates a taxable profit and incurs a tax liability that changes after correcting the accounting error. In such cases, the revenue authorities must be informed accordingly.

To further complicate the example in Table 2, assume that in 2020, instead of a tax loss, a taxable profit of 5,000 BGN is recorded. The correction of the tax loss and accounting error is presented in Table 3:

Table 3. Model for Tax Loss Carry-Forward and Correction of Accounting Error

№	Year	Tax profit before carry-forward of the tax loss in the relevant year		Tax loss in the relevant year to be carried forward		Total amount of tax losses from previous years subject to carry-forward		Amount of tax loss deducted in the relevant year		Adjustment of the tax loss for carry-forward under Art. 76		Balance of the tax loss for carry-forward in subsequent years	
		3.1 Country	3.2 Abroad	4.1 Country	4.2 Abroad	5.1 Country	5.2 Abroad	6.1 Country	6.2 Abroad	7.1 Country	7.2 Abroad	8.1 Country	8.2 Abroad
1	2016			5000								5000	
2	2017			4000		5000						9000	
3	2018			3000		9000						12000	
4	2019			4000		12000						16000	
5	2020	5000				16000		5000				11000	
6	2021			5000		11000						16000	
7	2022			2000		16000				-10000		4000	
8	2023			1000		4000						2000	
9	2024	20000				2000		2000				0	

Source: Author's calculations.

Table 3 reflects the correction of the tax loss following the realization of a profit in 2020, demonstrating how the initial tax loss of 5,000 BGN in 2016 (shown in black) is adjusted and not forfeited after the five-year period. Tax losses forfeited due to the expiration of the five-year period are highlighted in red, with corresponding adjustments noted in column 8.1.

Opportunities for using artificial intelligence in tax loss carry-forward and correction of accounting errors

Artificial intelligence (AI) can be applied in the following cases based on the proposed models:

- Automated tax loss carry-forward: AI can enhance specialized accounting software to achieve automated calculations for carrying forward losses from previous years to relevant periods, ensuring compliance with CITA requirements.
- Forecasting financial results: AI can predict future profits, enabling proactive tax planning.
- Identifying and correcting accounting errors: AI can analyse accounting data and, upon detecting errors, propose correction methods (e.g., for unreported revenue or misallocated expenses).
- Analysing tax scenarios: AI can simulate various tax loss carry-forward scenarios (with or without accounting error corrections) to identify the optimal approach for minimizing tax liabilities from the perspective of a non-financial sector enterprise.

Limitations of the proposed models

The use of hypothetical data limits the empirical validity of each model. Real-world data from enterprises across different countries would enhance the reliability of the results. Additionally, AI algorithms require significant computational resources and training with localized data, which may pose challenges in countries with limited digital infrastructure. Despite these limitations, the models provide a robust foundation for developing a globally applicable framework (Zhang et al., 2020).

Conclusion

In conclusion, the proposed models for tax loss carry-forward, with or without accounting error corrections, can be significantly enhanced through the application of artificial intelligence, offering substantial benefits for managerial decision-making based on predictive assumptions. Grounded in the CITA and IAS 12/NAS 12, the models strictly adhere to regulatory requirements, ensuring transparency and mitigating the impact of tax liabilities. They support sustainable financial management in non-financial sector enterprises within a competitive economic environment, enabling

managers to make informed decisions through the analysis of accounting data and error corrections.

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